

## **Historic, Archive Document**

Do not assume content reflects current scientific knowledge, policies, or practices.



Reserve  
atD194  
.66  
.C6D73  
1994



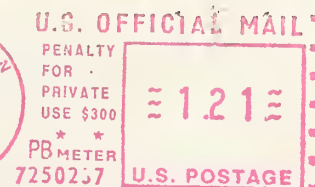
United States  
Department of  
Agriculture



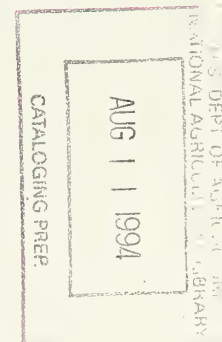
**National Agricultural Library**

**FEDERAL ENERGY REGULATORY COMMISSION  
WASHINGTON, D.C. 20426**

**OFFICIAL BUSINESS  
PENALTY FOR PRIVATE USE, \$300**



P-2187 150892  
HEAD, ACQUISITIONS BRANCH  
USDA NATIONAL AGRICULTURAL LIBRARY  
10301 BALTIMORE BLVD.  
BELTSVILLE, MD 20705





FEDERAL ENERGY REGULATORY COMMISSION  
WASHINGTON, D C 20426

MAR 11 1994

**To the Agency/Party Addressed:**

In accordance with the National Environmental Policy Act of 1969 and the Federal Energy Regulatory Commission's (Commission) regulations, 18 CFR Part 380 (Order No. 486, 52 F.R. 47897), the Commission's Office of Hydropower Licensing and U.S. Forest Service's staffs reviewed the development application and prepared the attached Draft Environmental Assessment (DEA).

Please submit any comments on the DEA within 45 days of the date of this letter. As lead agency, the Commission will accept all comments on the DEA. Comments should be addressed to Lois Cashell, Secretary, Federal Energy Regulatory Commission, 825 North Capitol Street, NE, Washington, D.C. 20426. Please affix the project number with all comments filed.

Sincerely,

Dean L. Shumway  
Director, Division of  
Project Review

Enclosure: Draft Environmental Assessment  
Georgetown Hydroelectric Project

**DRAFT  
ENVIRONMENTAL ASSESSMENT  
FOR HYDROPOWER LICENSE**

Georgetown Hydroelectric Project  
FERC Project No. 2187-002  
Colorado

Federal Energy Regulatory Commission  
Office of Hydropower Licensing  
Division of Project Review  
825 N. Capitol Street, NE  
Washington, D.C. 20426

and

USDA Forest Service  
Arapaho Roosevelt National Forest  
240 West Prospect  
Fort Collins, CO 80526

MAR 11 1994

**TABLE OF CONTENTS**

SUMMARY . . . . .	iv
I. APPLICATION . . . . .	1
II. PURPOSE AND NEED FOR ACTION . . . . .	1
A. Purpose of Action . . . . .	1
B. Need for Power . . . . .	3
III. PROPOSED ACTION AND ALTERNATIVES . . . . .	4
A. Public Service's Proposal . . . . .	4
1. Project Description . . . . .	4
2. Proposed Environmental Measures . . . . .	6
3. Mandatory Requirements Federal Land Management Conditions . . . . .	7
B. Alternative Environmental Measures . . . . .	7
C. No-action Alternative . . . . .	10
D. Alternatives Considered but Eliminated from Detailed Study . . . . .	10
IV. CONSULTATION AND COMPLIANCE . . . . .	11
A. Agency Consultation . . . . .	11
B. Interventions . . . . .	12
C. Water Quality Certificate . . . . .	12
V. ENVIRONMENTAL ANALYSIS . . . . .	12
A. General Description of the South Clear Creek Watershed . . . . .	12
B. Proposed Action and Action Alternatives . . . . .	14
1. Water Resources . . . . .	14
2. Fisheries Resources . . . . .	21
3. Terrestrial Resources . . . . .	33
4. Threatened and Endangered Species . . . . .	34
5. Cultural Resources . . . . .	44
6. Recreation . . . . .	48
7. Land Use . . . . .	58
C. No-Action Alternative . . . . .	60
VI. DEVELOPMENTAL ANALYSIS . . . . .	60
VII. CONSISTENCY WITH COMPREHENSIVE PLANS . . . . .	64
VIII. COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE . . . . .	67
IX. RECOMMENDATIONS OF FISH AND WILDLIFE AGENCIES . . . . .	75



XI. LITERATURE CITED . . . . .	78
XII. LIST OF PREPARERS . . . . .	82
APPENDIX A Public Lands and Privately owned Lands interspersed in Project vicinity	
APPENDIX B Proposed License Conditions	

## LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Location of the Georgetown Hydroelectric Project, FERC No. 2187, Colorado.	2
2. Major features of the Georgetown Hydroelectric Project, FERC No. 2187, Colorado.	5

## LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Summary of fish population density and standing crop biomass estimates in South Clear Creek.	22
2. Instream flow regimes for fishery resources in South Clear Creek using the Tennant Method.	26
3. Federally listed species dependent on Platte River Basin water.	35
4. Evaporative losses from the five Georgetown project impoundments.	38
5. Evaporative losses from the five Georgetown project impoundments compared to central Platte River flows	38
6. Existing recreation opportunities and facilities in the Georgetown Project area.	50
7. Economic analysis of minimum instream flow alternatives for the Georgetown Project.	62
8. Estimated cost of environmental enhancement measures for the Georgetown Project.	63
9. Minimum instream flow releases in cubic feet per second (cfs) to be provided at the Georgetown Hydro Project.	70
10. Analysis of fish and wildlife agency recommendations.	77

## SUMMARY

The Public Service Company of Colorado (Public Service), proposes to continue operating the 1,440-kilowatt (kW) Georgetown Hydroelectric Project No. 2187. The project is located on South Clear Creek in Clear Creek County, Colorado. This draft environmental assessment (EA) analyzes the effects of continued operation of the project and recommends conditions for future operation, should the Federal Energy Regulatory Commission (the Commission) decide to issue a subsequent hydropower license, and the Forest Service (the Forest) decide to issue a special-use permit, for the project.

In addition to Public Service's proposal, we considered two alternative actions: (1) Public Service's proposal with additional or modified environmental measures, and (2) no action.

In this EA, we (the Commission and Forest Service staffs) look at how the project affects environmental resources in the South Clear Creek Basin to determine whether other enhancement measures are needed to protect and improve the resources and provide for the best comprehensive development of the waterway.

In addition to the enhancements Public Service proposes, we recommend recreational enhancements that include: improving disabled access, expanding public use of project reservoirs, and rerouting the Silver Dollar trail to ensure continued public access. We also recommend a higher instream flow in South Clear Creek from Clear Lake to the forebay. This higher flow would provide fisheries enhancement and improve protection of the boreal western toad habitat. We further recommend keeping Murray and Silver Dollar reservoirs in the license. These reservoirs are presently a valuable recreation and cultural resource. We believe that among the alternative management scenarios foreseen for these reservoirs, preservation of their present use represents the highest public interest. We also recommend keeping Green Lake in the license and providing public access to the lake. We find the measures Public Service proposes with our additional recommendations would enhance existing environmental resources while allowing the project to continue to economically produce about 5.46 gigawatthours (GWh) of energy a year for Public Service's customers.

We find that none of the resources--which include water resources, fishery resources, wildlife resources, recreational resources and cultural resources--would suffer significant adverse impacts under our recommended alternative. Therefore, no environmental impact statement (EIS) is required.

## ENVIRONMENTAL ASSESSMENT

### FEDERAL ENERGY REGULATORY COMMISSION OFFICE OF HYDROPOWER LICENSING DIVISION OF PROJECT REVIEW

and

### USDA FOREST SERVICE ARAPAHO ROOSEVELT NATIONAL FOREST

Georgetown Hydroelectric Project  
FERC No. 2187-002-Colorado

## I. APPLICATION

On December 30, 1991, Public Service Company of Colorado (Public Service) filed an application for a minor license for the Georgetown Hydroelectric Project. The project is located on South Clear Creek, near the town of Georgetown, in Clear Creek County, Colorado (Figure 1). The 1.44-megawatt (MW) project occupies portions of the Arapaho National Forest (Forest) and Bureau of Land Management (BLM) lands.

## II. PURPOSE AND NEED FOR ACTION

### A. Purpose of Action

The Commission must decide: (1) whether to issue a subsequent license to Public Service for the project; and (2) what conditions should be placed on any license issued. The Forest Service must decide: (1) what license conditions are necessary for the adequate protection of National Forest System lands (NFS), and (2) what conditions are necessary in a special use authorization, if required, for those portions of the project that fall on NFS lands, if FERC decides to grant a subsequent license. Issuing a subsequent license and FS permit for the project would allow Public Service to continue to operate the project for the term of the license, making electric power from a renewable resource available to their customers.

In this Environmental Assessment (EA), we assess the environmental and economic effects of continuing to operate the project (1) as proposed by Public Service and (2) as proposed by Public Service with additional and modified enhancement measures. We also consider the effects of the no-action alternative.

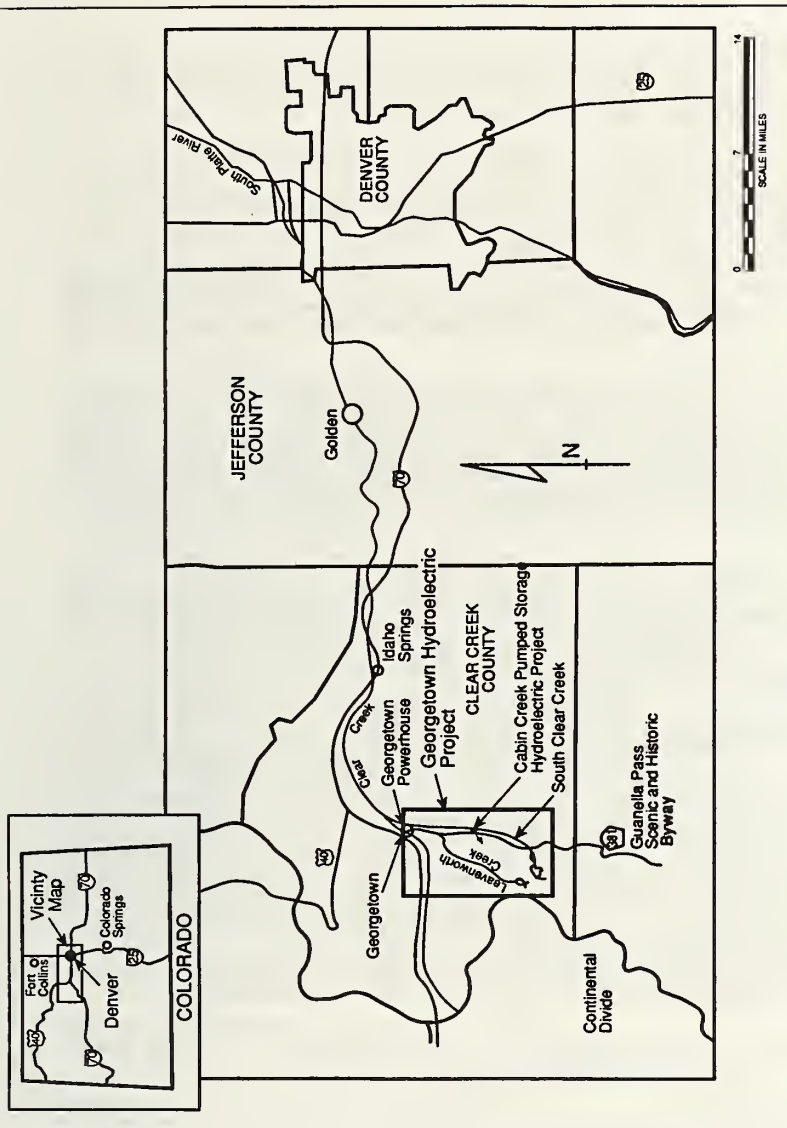


Figure 1. Location of the Georgetown Hydroelectric Project, FERC No. 2187, Colorado (Source: staff)

## B. Need for Power

The Georgetown Project currently produces 5.91 gigawatthours (GWh) of electrical energy annually. The project is located in the Rocky Mountain Power Area of the Western System Coordinating Council region. To consider the need for power, we looked at both Public Service's need and the regional need for power.

The power produced at the project is used in Public Service's electric utility system, which serves about 1 million wholesale and retail customers.

The project's average annual generation meets a small part (0.029 percent) of Public Service's annual requirement of about 20,200 GWh. The project output, used to serve local loads, also helps in lowering system deficits and reducing cost to ratepayers.

Public Service's Demand-Side Management Program Plan shows that a need for new utility owned generation will not occur until the mid-to-latter part (1996-1999) of the 10-year forecast period. The delay is due to: (1) the implementation of load management and conservation measures; (2) capacity exchanges with neighboring utilities; and (3) the refitting for natural gas of Fort St. Vrain nuclear plant.

To consider the regional need for power, we reviewed the demand forecast from the Rocky Mountain Power Area region. The April 1993 report on the Coordinated Bulk Power Supply Program projects peak demand and energy load growth rates in the region of 2.1 and 2.2 percent annually, over the 1992-2002 period. Existing generating resources in the region, as of January 1, 1993, are about 10,124 MW of capacity. About 1,337 MW of new resources will be added during the 10-year regional forecast.

In summary, both Public Service's and the regional forecasts show possible capacity deficits by the year 1999.

Besides lowering the cost to ratepayers, the project's output has been available to: (1) displace fossil-fueled power generation in the region; (2) conserve nonrenewable fuels; and (3) reduce the emission of noxious byproducts caused by the combustion of fossil fuels.



### III. PROPOSED ACTION AND ALTERNATIVES

#### A. Public Service's Proposal

##### 1. Project Description

Public Service proposes to continue operating the project and to enhance resources within the project boundary. There is no new construction planned. However, Public Service does propose changing the project boundaries by removing three project reservoirs from the subsequent license.

Hydropower was originally developed at the Georgetown Project during the period 1893-1906. The project began operation in 1906, and has operated since that time.

The existing project consists of: (a) the 13-foot-high<sup>1/</sup>, 160-foot-long Murray dam impounding the 9.3-acre Murray Lake; (b) the 8-foot-high<sup>1/</sup>, 60-foot-long Silver Dollar dam impounding the 17-acre Silver Dollar Lake; (c) the 11-acre Green Lake, impounded by the 8-foot-high, 150-foot-long Green Lake dam, and the 5-inch-diameter, 600-foot-long pipeline to South Clear Creek; (d) the diversion on Leavenworth Creek, the 3,947-foot-long, 22-inch to 12-inch-diameter pipeline which supplies water to Green Lake; (e) a 19-foot-high, 150-foot-long dam impounding the 26-acre Clear Lake reservoir; (f) a 1.3-mile-long stream reach from Clear Lake to the Georgetown forebay (forebay); (g) a 26-foot-high, 115-foot-long forebay dam impounding an 8-acre reservoir; (h) a 26-to 34-inch-diameter, 5,410-foot-long steel penstock; (i) a 1-mile-long stream bypass reach; (j) a powerhouse containing two 720-kW generating units; and (k) a substation connecting directly to Public Service's distribution system (Figure 2).

As shown in figure 2, there is one nonproject feature in the South Clear Creek watershed that influences Georgetown's operation through its minimum flow release -- Cabin Creek Pumped-storage Project's lower reservoir (FERC No. 2351). Cabin Creek is located between the upper reservoirs of Murray and Silver Dollar lakes, and the project's primary storage reservoir (Clear Lake).

The Georgetown powerhouse is operated via remote control from the Cabin Creek powerhouse. The output of the generators at the Georgetown powerhouse are adjusted to maintain a nearly constant water surface elevation at the forebay. Public Service would continue to operate the project by storing spring runoff and releasing winter streamflow from Clear Lake for power generation. Clear Lake is located 1.3 miles above the forebay.

<sup>1/</sup> Dimensions based upon visual estimate, site inspection report, Division of Dam Safety and Inspections, San Francisco Regional Office, August 1993.

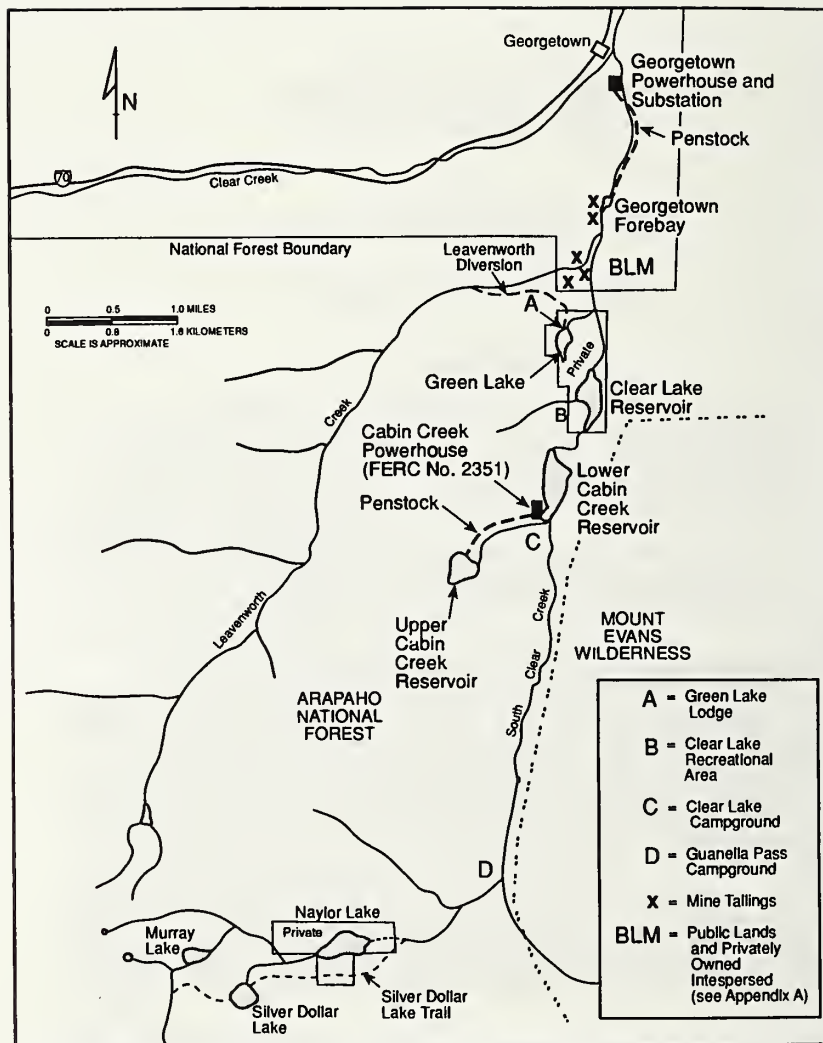


Figure 2. Major features of the Georgetown Hydroelectric Project, FERC No. 2187 (Source: Adapted from Project vicinity map (modified 1958 U.S. Geological Survey topographic maps) using 1984 Forest Service planimetric maps, Arapaho National Forest map, 1990)

Public Service proposes to modify the project boundaries by removing from the license: (1) Leavenworth diversion and Green Lake pipeline; (2) Green Lake dam and reservoir; (3) Murray dam and reservoir; and (4) Silver Dollar dam, reservoir, and ditch.

Public Service is proposing to remove these features from the project because they are not contributing to power generation at the Georgetown Project. Public Service lacks the ability to operate Murray and Silver Dollar Lakes for power because the outlet structures are in disrepair. Public Service says that the costs required to make the necessary repairs to the outlet works cannot be economically justified by the revenues that would be generated from using the storage at these lakes. Although Green Lake's outlet works are operable, Public Service isn't releasing flows from Green Lake for power generation at the Georgetown Project.

The San Francisco Regional Office (SFRO) inspected the Georgetown Project on August 10-11, 1993. They found Murray and Silver Dollar Lake dams were being overtopped, and the outlet works were in disrepair because of a lack of periodic maintenance and vandalism. SFRO is requiring Public Service to repair the embankments and spillway channels to prevent future overtopping of the dams. Public Service is also required to begin a periodic maintenance and inspection program for these lakes.

## **2. Proposed Environmental Measures**

To enhance environmental resources in the project area, Public Service proposes to:

- enhance aquatic resources in South Clear Creek by releasing from the forebay a minimum instream flow of 2 cubic feet per second (cfs) from September 1 to April 30, and 4 cfs from May 1 to August 31;
- ramp releases from Clear Lake reservoir to protect downstream aquatic resources;
- cooperate with Colorado Division of Wildlife and local interests to develop a recreational fishery in the South Clear Creek between Clear Lake and the forebay;
- install a staff gage at an accessible location between Clear Lake and the forebay to allow verification of Clear Lake flow releases;
- protect aquatic habitat in Leavenworth Creek by establishing a schedule that delays any water diversion to Green Lake until well after spring runoff has started;

- protect and maintain sites of the Georgetown Historic Hydroelectric District in the proposed project;
- open the historic project powerhouse to public tours and create a museum of the electric power industry for tourists visiting the town of Georgetown; and
- upgrade recreation facilities at Clear Lake by replacing picnic tables and charcoal grills, designating parking for the disabled, and installing interpretive signs.

We discuss each of these proposals in the individual resource sections of this EA.

## **3. Mandatory Requirements**

### **Federal Land Management Conditions**

Since the project occupies land of the Arapaho National Forest, the Forest Service (FS) has authority to impose conditions under Section 4(e) of the Federal Power Act (FPA). The FS will provide their 4(e) conditions after completion of this joint EA (U.S. Department of Agriculture 1993).

In its letter of March 19, 1993, the U.S. Department of the Interior (Interior) provided terms and conditions under Section 4(e) of the FPA for inclusion in any license issued. As a basis for its section 4(e) conditioning authority, Interior cites the Bureau of Land Management's (BLM) jurisdiction over certain lands within the project boundary. Our preliminary view is that Interior does not have authority, based upon BLM's land ownership, to impose conditions pursuant to section 4(e). Although we don't consider the terms and conditions to be Section 4(e) conditions, we address each of Interior's recommendations in Section V.B., Proposed Project and Action Alternatives.

### **B. Alternative Environmental Measures**

An interdisciplinary team, made up of Forest Service and FERC specialists with expertise in many disciplines, was formed to analyze the environmental effects of the proposed action. Scoping of issues was done by submittal of comments by the public, and state and federal agencies through the Commission's process.

Public notification and request for comments on the Georgetown Project were made by: (1) the notice of filed application in the January 22, 1992, Federal Register (57 FR 2525); (2) the notice of accepted application in the March 6, 1992, Federal Register (57 FR 13082); the May 11, 18, 26 and June 2, 1992, Clear Creek Courant, and copies sent to FERC's mailing



list for the project; (3) notice of "Ready for Environmental Analysis" in February 17, 1993, Federal Register (58 FR 8751), the February 4, 1993, Clear Creek Courant, and copies sent to FERC's mailing list; and (3) a site visit and public meeting on April 27, 1993.

Issues identified through this process are: (1) effect of reduced flows in the project's stream reaches; (2) additional recreational opportunities at Clear Lake; (3) protection of water quality at the forebay (Georgetown's water supply); (4) public versus private use of Green Lake; (5) protection of historic project features; (6) impacts on recreation from removing Murray and Silver Dollar reservoirs from subsequent license; and (7) cumulative impacts of this project and the Cabin Creek Pumped Storage Project (FERC no. 2351) on South Clear Creek.

After evaluating Public Service's proposal and reviewing recommendations from resource agencies and other interested parties, we considered what, if any, modifications to Public Service's measures or additional protection or enhancement measures would address the identified issues and be beneficial to resources affected by continued operation of the project. Therefore, we looked at the following additional environmental measures and project modifications:

- Provide a instantaneous minimum flow of 7.5 cfs from May 1 to August 31, and 3.25 cfs from September 1 to April 30, or natural inflow if less, from Clear Lake to the forebay, and a instantaneous minimum flow of 4 cfs from May 1 to August 31, and 2 cfs from September 1 to April 30, from the forebay to the powerhouse
- Prepare a plan to monitor instream flow releases from and drawdown requirements for Clear Lake
- Reopen the Georgetown license to coincide with the relicensing of the Cabin Creek Pumped-storage Project (February 28, 2014) to evaluate instream flow enhancements
- Enhance and manage recreational opportunities at the project by:
  - (1) opening Green Lake to the public;
  - (2) allowing non-motorized boating on Green and Clear Lakes;
  - (3) preparing a plan for improving disabled access to the Clear Lake shoreline;

(4) rerouting the Murray and Silver Dollar Lake trail around private land at Naylor Lake or obtain an access easement; and

(5) preparing a plan for restricting public vehicular access across South Clear Creek at the south end of the project forebay, but encouraging non-motorized access.

- Retain Murray, Silver Dollar and Green lakes within the project license to maintain present cultural, recreational, wildlife and fishery resources

To analyze the effects of removing these reservoirs from the project license, we determined possible foreseeable future actions at the reservoirs if they were removed. If removed, Murray and Silver Dollar lakes would revert to FS jurisdiction. The FS (1993) indicated that the reasons given by Public Service for the continued existence of the reservoirs outside of hydropower were unsatisfactory, and that they may require the removal of the dams. Also, Public Service says they intend to put the Murray and Silver Dollar lakes outlet works back into operational condition if the lakes storage can be used to replace reservoir evaporation losses at the Cabin Creek Project (Public Service Company of Colorado 1993). Therefore, for Murray and Silver Dollar lakes we examine the options of dam removal, use of the lakes to replace reservoir evaporation at Cabin Creek, and the status quo as possible foreseeable future actions should we recommend removal from the project license.

Any application by Public Service to amend the Cabin Creek license to use these reservoirs to replace evaporative water losses would be evaluated under NEPA, including an evaluation of those potential impacts in greater detail.

Green Lake would remain closed to public access if removed from the project license. Public Service says they intend to continue historic operations of Green Lake (i.e., diverting water from Leavenworth Creek after spring runoff has begun). The Leavenworth Creek diversion has the potential to affect flows in the project area, and if removed from the license, there would be no measures to guarantee the protection of aquatic resources that can be affected by the diversion. Therefore, for Green Lake we examine the options of no public access versus public access, and how the operation of Green Lake could affect aquatic resources as possible foreseeable future actions should we recommend removal from the project license.

We discuss each measure in the individual resource section of this EA.

### C. No-Action Alternative

Under the no-action alternative, the project would continue to operate under the terms and conditions of the existing license, and no new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives. The alternative of license denial and project decommissioning is discussed below in Alternatives Considered but Eliminated from Detailed Study.

### D. Alternatives Considered but Eliminated from Detailed Study

We considered two alternatives for decommissioning the project but eliminated them from detailed study because they are not reasonable in the circumstances of the case. Project decommissioning could be accomplished with or without dam removal. Either alternative would involve denial of the subsequent license application and surrender or termination of the existing license with appropriate conditions.

The first decommissioning alternative would involve the removal of all project dams -- Clear Lake, the forebay, as well as Green, Murray and Silver Dollar lakes. We don't regard removing the dams as reasonable because the probable environmental effects of dam removal would include:

- Aesthetic, recreational, and socioeconomic benefits for Silver Dollar, Murray, Clear, and Green lakes would be significantly decreased if the lakes were lowered.
- Lowering the water level in Clear Lake could have a significant adverse effect on wetlands adjacent to the lake.
- Handling and stabilizing the accumulation of sediment behind the dams could have significant adverse effects on water quality, fish, recreation, and aesthetics.
- The historical landscape would be adversely altered. The Georgetown Historic Hydroelectric District would be destroyed. The District consists of five sites, four of which are project dams and reservoirs that would be removed. The only surviving site would be the project powerhouse, and it almost certainly would not have any historical significance without the other sites.

Removal would probably also have an adverse effect on the Georgetown-Silver Plume National Historic Landmark, an historical property of national significance, since removal of the District would detract from the historical setting in which the Landmark is located.

Although, we will be analyzing the impacts of the removal of Murray, Silver Dollar, and Green lakes from the project boundaries, we don't regard removing all the dams as reasonable. No participant has suggested the removal of all project dams, and we have no basis for recommending it. The reservoirs serve other important purposes, such as recreation, and the preservation of cultural resources and wetlands, regardless of whether power is produced. Because the adverse impacts of dam removal greatly exceed the benefits, we consider the removal of all dams an unreasonable alternative and we eliminated it from detailed study.

The second decommissioning alternative would involve retaining the dams and disabling or removing equipment used to generate power. Project works would remain in place and could be used for historic or other purposes. This would require us to identify another government agency willing and able to assume regulatory control and supervision of the remaining facilities. No agency has stepped forward, and no participant has advocated this alternative. Nor have we any basis for recommending it. Because the power supplied by the project is needed, a source of replacement power would have to be identified. In these circumstances, we don't consider removal of the electric generating equipment to be a reasonable alternative.

## IV. CONSULTATION AND COMPLIANCE

### A. Agency Consultation

The Commission's regulations require prospective applicants to consult with the appropriate resource agencies before filing a license application. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the Endangered Species Act, the National Historic Preservation Act, and other federal statutes. Pre-filing consultation must be complete and documented in accordance with the Commission's regulations.

After the Commission issued a public notice on January 22, 1993, saying that the application for the Georgetown Hydroelectric Project was ready for environmental analysis, the following entities commented on the application.

<u>Commenting Entities</u>	<u>Date of Letter</u>
Colorado Division of Wildlife	March 15, 1993
U.S. Forest Service	March 19, 1993
Department of the Interior -- U.S. Fish and Wildlife Service and the Bureau of Land Management	March 19, 1993



## B. Interventions

Besides providing comments, organizations and individuals may petition to intervene and become a party to any subsequent proceedings. There were no motions to intervene filed on the Georgetown Project.

## C. Water Quality Certification

Public Service applied for a water quality certificate on April 5, 1991. On April 29, 1991, the Colorado Department of Health issued a water quality certificate for the project under Section 401 of the Clean Water Act. The Colorado Department of Health set no 401 conditions for the Georgetown Project.

# V. ENVIRONMENTAL ANALYSIS

In this section, we analyze and compare the environmental effects of Public Service's proposal, alternatives for continued operation of the project, and no-action. In addition to project-specific impacts, we analyze the potential for significant cumulative impacts to resources affected by the project and by other past, present, and reasonably foreseeable activities in the watershed. A discussion on consistency with the Forest Service Land and Resource Management Plan is found in the Consistency with Comprehensive Plans section. Where trade-offs with power or other nonpower resources must be made, the final conclusions are found in the Comprehensive Development and Recommended Alternative section.

## A. General Description of the South Clear Creek Watershed 2/

The Georgetown Project is located high in the Rocky Mountains on South Clear Creek. A drainage basin of about 28.3 square miles provides water for the project. South Clear Creek is a tributary to the South Platte River.

Historically, one of the first fish hatcheries in the state was located at Green Lake in the early 1870's (Colorado Division of Wildlife 1985). During the 1870's, W. H. Cushman developed a resort at Green Lake that included a hatchery, and the water diversion from Leavenworth Creek to maintain Green Lake's water level throughout the year. The hatchery produced both trout and salmon. Salmon had been successfully shipped and hatched from California stocks from 1874 to 1876. As a result both Clear and

2/ Unless otherwise indicated, the source of our information is Public Service Company of Colorado's application for new license for the Georgetown Project (1991).

Green lakes were stocked heavily with fish, and provided excellent fishing opportunities.

The various facilities of the Georgetown Project were constructed during the period 1893 to 1906. The project began operation in 1906 and has operated continuously since that time. Three upstream reservoirs (Murray Lake, Silver Dollar Lake, and Green Lake) were originally deepened and used for project storage. However, in the last couple of decades, the operation of these lakes has changed from storage for power generation purposes to recreational usage.

Currently, the Georgetown Project affects both the riparian and aquatic habitats in the watershed through flow release patterns and minimum instream flows from Clear Lake, and flow diversions from Leavenworth Creek.

The 300-MW Cabin Creek Pumped-storage Project is also in the South Clear Creek watershed. It is located between the upper Georgetown reservoirs and Clear Lake (Figure 2). Cabin Creek's minimum flow release (3 cfs, or natural inflow, if less) controls streamflow for the Georgetown Project during the lower flow periods of the year.

Together the Georgetown and Cabin Creek projects have cumulatively affected the fishery in the South Clear Creek watershed. In the Fishery (Section V.B.2) section of this EA, we discuss the site-specific as well as the cumulative effects of relicensing the Georgetown Project on the fishery resource.

The Jerry B. Buckley Project (FERC No. 8118) is located just north of the town of Georgetown on Clear Creek. It is a minor project that is currently being constructed. The Jerry B. Buckley Project has no influence over protection and enhancement measures for the relicensing of the Georgetown Project.

The project area and basin are heavily used for outdoor recreation. Hunting, fishing, hiking, skiing, mountain biking, and camping are all available nearby. Natural scenery is also a major attraction for visitors. The Guanella Pass Scenic and Historic Byway (County Road No. 381) brings many sightseers through the project area.

Lands in the immediate vicinity of the project are under a mix of public and private ownership. Public land at the project includes lands managed by the Forest and BLM. Private landholdings in the vicinity include mining claims, scattered residences and camps, and hydroelectric developments.

Only resources that would be affected are included in this environmental analysis. We conclude that because there are no

changes that require land-disturbing activities, there would be no significant impacts on visual resources, or geology and soils. Therefore, we have excluded these resources from our detailed analysis.

## **B. Proposed Action and Action Alternatives**

In this section, we discuss each environmental resource the project affects. For each resource, we first describe the affected environment--which is the existing condition and the baseline against which to measure the effects of the proposed project and any alternative actions--and then the environmental effects of the project including any proposed enhancement measures.

### **1. Water Resources**

**Affected Environment:** The South Clear Creek watershed is heavily mineralized and mining has occurred there since the 1850's. Sediments from the watershed contain a high natural concentration of metals. In the early 1870's, water was diverted from Leavenworth Creek to Green Lake for the development of the Green Lake resort and fishery (Wiltzius 1985). All other project impoundments (Clear, Murray, and Silver Dollar lakes, and the forebay) were deepened around the turn of the century and used for storage.

The project stores and diverts water from South Clear Creek, a tributary of Clear Creek, which flows into the South Platte River. The project also receives flow from Leavenworth Creek, which flows into South Clear Creek below Clear Lake and above the project forebay (Figure 2). Annual precipitation ranges from 15 inches near Georgetown at the watershed mouth to more than 30 inches near the headwaters. About 50 to 60 percent of annual precipitation falls as snow.

The nearest U.S. Geological Survey stream gage is located on Clear Creek near Lawson (gage No. 06716500), about eight miles downstream of the confluence of South Clear Creek and Clear Creek. Flow information for the project area is based on this Lawson gage and adjusted using a drainage area ratio.

Average annual water yield for the project area is about 19,000 acre feet (af), or a mean annual flow of 26 cfs. Annual maximum mean daily flows average about 160 cfs. Annual minimum daily flows are about 4 cfs. Mean monthly flows range from 5 cfs during winter months to 31 cfs during the summer.

The Georgetown Project presently has no minimum flow requirement, however the Cabin Creek Pumped-storage Project releases 3 cfs or natural inflow, if less. Stream flows in South Clear Creek are altered by the release patterns from both of

these projects. During spring runoff, Cabin Creek uses flows in excess of the needed minimum flow release to refill losses due to seepage and evaporation. Clear Lake reservoir also stores water in the spring and later releases water to augment flows for power generation during the winter, which increases flows in South Clear Creek between Clear Lake and the forebay.

Historically, some minimum level of flow has been maintained in the stream section between Clear Lake and the forebay. However, no operating plan exists for the Clear Lake dam and no minimum instream flow requirement presently exists for the Georgetown Project. The two licensed projects in South Clear Creek affect streamflow and habitat for 2.7 miles of South Clear Creek.

A complete analysis of the proposed streamflow alternatives is found in the fisheries section of this EA.

### **Project Operation**

The bulk of streamflow is diverted at the forebay into a 36 cfs capacity pipeline, which bypasses a 5,410-foot-long section of South Clear Creek. Flow into the penstock is adjusted to maintain a nearly constant water level in the forebay. By informal agreement, Public Service siphons a minimum 1 cfs into the bypass reach for Georgetown's municipal water supply. The town's drinking water intake is located about 800 feet above the powerhouse.

The project is operated run-of-river whenever possible. However, during winter months, flow is supplemented by releases from Clear Lake. Clear Lake contains about 590 acre feet of active storage. The reservoir is filled during spring runoff when flow at the forebay is in excess of penstock capacity. When flow exceeds penstock capacity and the reservoir is not filling, water is spilled into the bypass reach.

### **Water Quality**

South Clear Creek is classified by the Colorado Water Quality Control Commission as Cold Water Aquatic Life Class 1 and Cold Water Recreation Class 1. Leavenworth Creek is classified as Cold Water Aquatic Class 2 and Cold Water Recreation Class 1. Both streams are classified as Domestic Water Supply.

Aquatic Life Class 1 waters are capable of sustaining a wide variety of cold water biota, including sensitive species. Aquatic Life Class 2 waters are not capable of sustaining cold water biota due to uncorrectable water quality conditions, limitations of physical habitat, or water flow factors. Domestic Water Supply streams are those which, after standard treatment,



meet Colorado drinking water regulations. Recreation Class 1 streams are suitable for prolonged body contact.

Public Service collected water quality samples in the fall of 1990. Samples were collected at the following sites, in order progressing downstream in South Clear Creek: (1) upstream from lower Cabin Creek Reservoir; (2) immediately upstream of the dam at Clear Lake; (3) between the confluence with Leavenworth Creek and the forebay; (4) immediately above the dam at the forebay; (5) in the bypass reach downstream from the forebay, and (6) immediately downstream from the powerhouse tailrace. Testing indicated that measured water quality parameters fall within the established numeric state standards for class 1 and class 2 streams.

Sediments from the watershed contain a high natural concentration of metals, including lead, iron, and manganese. Sediment contributed from old mine spoils increases this concentration.

Sediment samples collected with water quality samples indicate there is an increase in the concentration of metals found in sediment in Clear Lake and the forebay. The concentration of iron occurring in sediment is 7 to 14 times higher in the reservoirs than in South Clear Creek. The concentration of manganese in the sediments is 2 to 5 times higher. However, all sediment metal concentrations were below Environmental Protection Agency (EPA) toxicity limits.

Results of trace metal analyses of the composite fish tissue samples taken from fish collected at the project indicate the presence of lead at concentrations which are deleterious to human health if the fish are consumed. The U.S. Government currently does not have a criterion that delineates how much lead in fish tissue is acceptable, but the EPA often uses the World Health Organization (WHO) criteria in making risk assessment procedures. The WHO has set a 0.3 micrograms per gram ( $\mu\text{g/g}$ ) wet weight criteria for lead in fish destined for human consumption (World Health Organization 1972). The highest concentration found in fish sampled was 1.32  $\mu\text{g/g}$ .

Selenium is also present in several fish at concentrations that are close to concentrations known to be deleterious to human health if the fish are consumed. WHO has a 1.0  $\mu\text{g/g}$  criteria for selenium, and several of the recalculated samples are within 20 percent of this value. No other metals were found in fish tissue samples at concentrations believed harmful to human health.

#### Water Rights

The town of Georgetown owns the only water right in the project area that is not part of the project. The inlet for the

town water supply is located near the lower end of the bypass reach. As we've said, Public Service maintains a siphon (1-cfs) into the bypass reach so that sufficient water is made available to meet the town's potable water supply needs.

In addition, there are three adjudicated exchanges involving water rights for Clear Lake. Exchanges provide the opportunity for a party to divert water out of priority at one location by releasing it at another location. For example, the Loveland Ski Area can divert water from Clear Creek out of priority as long as the same amount of water is released from Clear Lake. Exchange decrees for Clear Lake are as follows.

<u>Structure</u> <u>Appropriation</u>	<u>Source</u>	<u>Amount</u>	<u>Adjudication</u>
Clear Lake/Loveland 12/31/88	S. Clear Cr	0.70-cfs	12/30/88
Clear Lake/Henderson 12/31/88	S. Clear Cr	11.00-cfs	12/30/88
Clear L./Straight Cr 12/31/88	S. Clear Cr	11.00-cfs	12/30/88

Public Service's continued use of the water to operate the project as proposed should not affect any known water rights.

#### Environmental impacts and recommendations:

##### a. Drawdown of Clear Lake

Public Service uses the water stored in Clear Lake for winter power generation. Historically, the storage was used to generate during winter low-flow periods, then the outlet works were opened for drawdown to minimum pool just prior spring to runoff. This drawdown to minimum pool allows Public Service to annually inspect the outlet works. The result of the drawdown was a rapid flush of water in April. Public Service and Colorado Division of Wildlife (CDOW) agreed that a rapid flush of water could result in negative impacts to stream habitats.

Recently, an informal agreement was reached between Public Service and the CDOW for controlling drawdowns. The specifics of this agreement are as follows -- The Clear Lake drawdown should begin on February 1 of each year and that change in outlet discharge to South Clear Creek not exceed 50 percent per week. As active storage is depleted, outflow to South Clear Creek should be decreased according to this 50 percent rule, so discharge is not suddenly stopped. When refilling Clear Lake, changes in outflow should be limited to increases of 50 percent per week, or daily if needed, until spilling or natural inflow to



Clear Lake is reached, whichever occurs first. 3/ Prior to February 1, discharge should be equal to, or greater than, natural inflow.

The U.S. Fish and Wildlife Service (FWS) agrees with this agreement, with one small difference--FWS recommends that during refilling of Clear Lake, no exception be made to allow for daily changes in flow.

We recognize that drawdown control rates for Clear Lake are needed. A rapid flush of water in April could lead to stranding of fish or desiccation of redds, or result in loss of juveniles and alevins due to high water velocities. Drawdown rates should prevent sudden changes in streamflows below the reservoir, and therefore protect the aquatic resources downstream of Clear Lake. This drawdown agreement would also decrease the discharge difference between outflow just before and after spilling.

Additionally, with the snowmelt runoff that occurs in the South Clear Creek watershed, a condition that allows changes in outflow during refilling to daily adjustments would provide better protection to the fisheries resources than a weekly adjustment. Consequently, we concur with the informal agreement between Public Service and CDOW.

Therefore, we recommend that Public Service implement the proposed operational agreement for Clear Lake. In addition, measures to monitor water diversions are needed to verify compliance of diversions starting after spring runoff has begun.

#### **b. Removal of project sediment**

Because of the high natural concentration of metals contained in the watershed's sediment, Public Service should continue to operate the project to maintain the forebay's water surface elevation to minimize disturbances of sediment within the forebay. In the initial license application, Public Service had proposed dredging the forebay. After reappraising the need for dredging and its potential environmental impacts, Public Service withdrew this proposal. We foresee no need for dredging the forebay at this time.

If dredging the forebay becomes necessary, the BLM requests that any materials dredged from the forebay be tested before removal and be appropriately disposed of. If dredging becomes necessary, Public Service would be required to file with the Commission a dredging plan for the removal and disposal of accumulated sediments from the forebay. The dredging plan would

---

3/ personal communication, Greg Policky, Biologist, Colorado Division of Wildlife, Denver, Colorado. July 16, 1993.

be developed in consultation and agreement with state and federal resource agencies to determine: (1) if dredging is necessary and a worth while measure; (2) how often the reservoir would need dredging; (3) where and how the dredged materials will be disposed of; and (4) what measures will be taken to protect water quality during dredging operations.

Continued operation of the project should not lead to disruption of sediment deposits, and therefore should keep materials from being resuspended in the water column.

#### **c. Removal of facilities from project license**

As we've said, Public Service proposes to modify the project boundaries by removing from the license: (1) Leavenworth diversion, Green Lake pipeline, and Green Lake dam and reservoir; (2) Murray dam and reservoir; and (3) Silver Dollar dam, reservoir, and ditch. We discuss the Green Lake facilities separately for two reasons: their locations are physically independent from Murray and Silver Dollar facilities (see figure 2), and if removed from the project license, Green Lake would be managed as private property, whereas Murray and Silver Dollar lakes would be managed by the FS.

#### Green Lake Facilities

Historically, during peak runoff periods, 1.0 cfs is diverted from Leavenworth Creek to refill Green Lake. Once Green Lake refills, the diversion from Leavenworth Creek is reduced to about 0.25 cfs, and is maintained at this level through the summer season. In the fall, the diversion structure is closed. The water level of Green Lake declines from natural losses over winter (evaporation, seepage) and then is refilled again by flow diversions the following spring. Public Service proposes to continue this operation.

The CDOW's position is that the Leavenworth Creek diversion pipeline should remain in the license since it has the potential to affect flows in the project area.

We agree that there could be an effect on project streamflow if Green Lake, and its related facilities (i.e., Leavenworth diversion, Green Lake pipeline, and Green Lake dam) are removed from the project boundaries as proposed by Public Service. Releasing Green Lake's storage could affect flows within the project or diverting water from Leavenworth during low flow periods could cause negative impacts to the aquatic resources of Leavenworth Creek. Therefore, since the Leavenworth diversion and Green Lake has the potential to affect flows in the project area, we recommend keeping these facilities in the subsequent license for the protection of aquatic habitat in Leavenworth Creek and within the project boundaries.

## Murray and Silver Dollar Facilities

As we said, Public Service proposes to remove Murray and Silver Dollar lakes (and related facilities) from the project boundaries. Presently, the outlet works are inoperable and there is no control over what flows into or out of these alpine lakes. Therefore, any flow entering South Clear Creek from these two lakes cannot be controlled through project operation.

If the outlet structures were repaired at these lakes, the water stored in them could be used to increase streamflow in South Clear Creek. The low-flow period occurs during winter (December through March); therefore, to use this stored water to help increase winter flow for project generation would require Public Service to operate the outlet works during severe winter conditions. Any problems with the outlet works would likely remain unresolved until after March snowmelt (because access to Murray and Silver Dollar lakes is restricted to cross country skiing and snowshoeing). Consequently, the flows wouldn't always be available when needed. A further discussion on the use of storage and the effects of dam removal at Murray and Silver Dollar lakes is found in subsequent resource sections.

### **d. Diversions from Leavenworth Creek**

Public Service proposes to continue a schedule that delays any diversion of water from Leavenworth Creek to fill Green Lake until after runoff has started, thus avoiding potential impacts to aquatic resources (e.g., stranding of fish) in Leavenworth Creek that could occur during low flow conditions. The FWS and CDOW agree that the Leavenworth diversion should begin operating only after the start of spring runoff.

We agree that limiting the diversion of flows to the high-flow season (spring and summer) would protect the aquatic resources in Leavenworth Creek. The total amount of withdrawal (1 cfs) would be relatively small (less than 5 percent of prevailing streamflow) in comparison to natural flow in the stream when the diversion is made. Setting a schedule with specific dates is impractical in a snow driven runoff system. Allowances need to be made for climatic conditions that could vary the timing of spring runoff.

Therefore, we recommend that Public Service, after consulting with FWS, FS, CDOW and BLM, submit for Commission approval, a plan for the timing of diverting flows from Leavenworth Creek to Green Lake. The plan should have the flexibility needed to allow for changes in the beginning of spring runoff, and monitoring measures to ensure diversions occur after runoff has begun.

Unavoidable Adverse Impacts: None

## **2. Fisheries Resources**

Affected Environment: Historically, one of the states earliest fish hatcheries was located at Green Lake and cultured Eastern and Rocky Mountain strains of trout, and chinook salmon (Wiltzius 1985). Perhaps as early as 1873, land developer W.H. Cushman stocked Green Lake with Mountain trout. Early federal fish distribution records show as many as 565,000 chinook salmon eggs being sent from the Baird Station in California to W.H. Cushman in Georgetown from 1874 to 1876. Reports of that day, report over 150,000 trout and salmon being stocked into Green Lake. While the reports are unclear as to the actual stocking practices of Green Lake, it appears that salmon were stocked into Clear Lake. Suckers were reportedly introduced into Clear Lake in 1879. The promotion of a recreational fishery in South Clear Creek predates the development of hydropower projects, and shows the importance of the fishery in the project area.

Today, the fishery resources in South Clear Creek are more typical of cold water alpine and subalpine streams and lakes of the Rocky Mountain region. Resident fish species include rainbow trout, cutthroat trout, brown trout, and brook trout. South Clear Creek is within the historic range of the greenback cutthroat trout (*Oncorhynchus clarki stomias*), which is federally listed as threatened. Public Service states there are no records documenting the occurrence of greenback cutthroat in South Clear Creek and they are not thought to be present at this time.

The brook trout is the most abundant fish species in South Clear Creek. Brook trout are well adapted to this environment and the population is self-sustaining. All four of the trout species present are thought to successfully reproduce in South Clear Creek.

In addition, upper South Clear Creek (above Clear Lake) and Clear Lake are managed as a put-and-take rainbow trout fishery by the CDOW. During the period from 1987 to 1992, CDOW stocked into South Clear Creek an average of about 5,800 catchable-size rainbow trout per year. Plus, during that same time period, CDOW also stocked on average over 13,000 catchable-size rainbow trout annually into Clear Lake. CDOW also says both Murray and Silver Dollar lakes presently support excellent cutthroat trout populations and provide quality, hike-in angling opportunities. The stream and all lakes receive heavy recreational fishing pressure.

Aquatic habitat affected by project operations includes 1.3 miles of stream between Clear Lake and the forebay, and about one mile of stream between the forebay and the powerhouse (the bypass reach).



With a 13 percent gradient, the bypass reach is the steepest reach in the project area. It's well documented that most useable fish habitat in steep boulder streams, occurs in pools (Nehring and Miller 1987; Trihey and Baldridge 1985; Humphrey et al. 1985). We assume that most useable fish habitat in the bypass reach consists of pools, although fish probably use low velocity areas of some cascades. This steep gradient may also limit upstream fish migrations and hinder accessibility.

In comparison, the reach from Clear Lake to the forebay has a much lower gradient (3 to 7 percent) and is more accessible to fishermen than the bypass reach. The primary effects of project operations on these environments is the alteration of streamflow.

Fish population estimates were obtained at four locations to help evaluate project influence on the fishery (Table 1). The survey above lower Cabin Creek reservoir (Figure 2) found the population density and standing crop biomass lower than in the bypass reach. The reach above lower Cabin Creek reservoir is stocked with rainbow trout and the survey found many indicators of the reach being heavily fished.

Table 1. Summary of fish population density and standing crop biomass estimates in South Clear Creek.

Site	Density No./Mile	Biomass lbs/Mile
Below Georgetown Bypass Reach	3056 ± 4.7	726.1
Bypass Reach (just below forebay)	1065 ± 15.1	94.5
Between forebay and Leavenworth Creek	1779 ± 35.6	348.0
Upstream of Cabin Creek Lower Reservoir	937.9	79.6

The highest densities of trout occurred downstream from the powerhouse. At the time collections were made, most of the brook trout collected were in spawning or post-spawning condition. Thus, it is likely that the density of fish in the reach is elevated due to the spawning movement of fish into the reach from Clear Creek.

Fishing pressure at both the bypass reach and the reach above the forebay is minimal. The difference in the size and flow regime between the stream reaches, however, is reflected in a significant difference in the number of fish per mile of stream and biomass. This difference may be due to the difference between the average stream width (and average discharge through the reaches) upstream and downstream from the forebay. Through

much of the year, flow in the bypass reach is limited to the 1 cfs release to provide a source of drinking water for Georgetown. Consistent with the diversion of water from the channel, the number of fish per mile of stream is expected to be less than in a reach such as the reach between Clear Lake and the forebay which is at or near natural flow through the summer and fall season. The population in the reach between Clear Lake and the forebay is enhanced by project operation particularly through the winter months when flow in the reach is supplemented by storage in Clear Lake.

Thus, the flow releases from Clear Lake and the resulting population in the reach between Clear Lake and the forebay provide a reasonable relationship to examine the fisheries enhancement potential for the bypass reach. The difference in biomass represents a potential gain of about 255 pounds of fish annually or about 700 more trout.

#### Environmental Impacts and Recommendations:

##### **a. Minimum instream flow releases**

Under the existing license, there is no minimum flow requirement. To enhance aquatic resources in South Clear Creek, Public Service proposes to establish a minimum instream flow release from the Clear Creek dam to below the forebay as follows:

- 4 cfs from May 1 to August 31, and
- 2 cfs from September 1 to April 30

Public Service's proposed minimum flow proposal was made on the basis of a Habitat Quality Index (HQI, model II) study. The HQI method was developed by the Wyoming Game and Fish Department to predict standing crops of trout in Wyoming streams (Binns 1979, Binns and Eiserman 1979). HQI is not an incremental flow model designed specifically to quantify changes in physical habitat as a function of flow.

For comparative purposes, the CDOW conducted an additional assessment of minimum instream flows using the R2CROSS method. The R2CROSS method has been adopted by the CDOW and the Colorado Water Conservation Board as their principal method for determining minimum flows needed to protect fishery resources in streams.

Like the HQI, R2CROSS is not an incremental flow model designed specifically to quantify changes in physical habitat as a function of flow. Using the R2CROSS, CDOW, FWS, and BLM recommend a minimum instantaneous flow for South Clear Creek from the Clear Lake dam to below the forebay as follows:

- 7.5 cfs from May 1 to August 31
- 3.25 cfs from September 1 to April 30

An HQI model uses stepwise multiple linear regression techniques to identify correlations of 11 habitat variables to fish biomass. As with many habitat assessment models, HQI assumes physical habitat to be the primary limiting factor for structuring the fish population. With this assumption, it recognizes that any HQI habitat assessment should represent the most limiting habitat conditions for fisheries resources.

Based on the HQI data, Public Service believes that as flow exceeds 4 cfs in South Clear Creek, any positive gains in stream width and water velocities are offset by a loss of fish cover, with the net result being no significant increase in fish habitat. Therefore, Public Service argues that the agencies' (FWS, CDOW, and BLM) recommended instream flow proposal would provide little benefit to the fishery.

The agencies believe that the HQI model used by Public Service was not applied in the context for which it was developed, and therefore, is an inappropriate tool for assessing flow-habitat relationships.

The agencies cited several factors to support their claims. The agencies thought that the definitions used to define cover during the field studies were not consistent with those defined by the developers of the model. Specifically, surface turbulence cover was omitted, which if included would have significantly increased the amount of cover measured at higher flows. The ability of observers to identify other forms of cover at higher flows was also a concern. They thought that increased depth, turbidity, and turbulence, and an inability to access the entire stream at higher flows, also resulted in less cover being measured than was actually present.

The way the cover variable is treated in the HQI model was also a concern to the resource agencies. The model uses a percent cover index which relates the cover area to the total stream area. As the area of the stream increases with increasing flow, the percent cover decreases if no new cover is formed. Under these conditions, the model will predict a decrease in fish biomass, when the actual amount of cover has not changed, yet habitat area has increased.

The combined effect of the above factors influencing the cover variable could have a substantial effect on the study results. As mentioned earlier, the HQI model was developed using stepwise linear regression techniques. The stepwise approach is known to be sensitive to relatively small changes in the data. Therefore, any change in a highly correlated variable, like

cover, can strongly influence the dependent variable, in this case biomass.

The HQI results are inconsistent with the population survey comparisons. The population survey results indicate a reduction in biomass of 77 percent (not the 56 percent predicted by the HQI data) when comparing the bypass reach to the section immediately above the forebay. This stream section (above the forebay) is not dewatered to the extent of the bypass reach and experiences flows much greater than 4-cfs. Although it was recognized that stream gradients differ for both stream reaches under consideration, biologists conducting the population surveys agreed that a comparison of these two locations was most appropriate since controlling factors were more consistent for the two sites than for other sites on the creek.

Based on the above discussion, we believe that the HQI results don't accurately provide a predictive capability beyond the base flow level assessments for which the method was designed. We believe that the actual surveys of fish density and biomass observed inside and outside of the project boundaries in South Clear Creek are more indicative of potential project enhancements, than predictions from the HQI interpretations.

The R2CROSS is considered a "standard setting" technique that establishes a single stage as the minimum flow desired. The R2CROSS method assumes that if instream flow is sufficient in the critical stream areas it would also be adequate throughout the stream reach. This single stage is determined when three criteria are met: the stream is at 50 percent of bankfull wetted perimeter; a minimum average depth of 1 percent top width (or 0.2 foot minimum); and the mean velocity of the stream is at 1 foot per second (Wesch and Rechar 1980). These three criteria were identified using habitat suitability criteria for salmonid species.

A second stage can also be determined when two of the above criteria are met. This "two-stage" approach is being used by CDOW to identify acceptable minimum flows on a biseasonal basis, and was used for this assessment.

As a result of the R2CROSS analysis, the CDOW, FWS, and BLM recommend an instantaneous minimum instream flow below Clear Lake Dam and the forebay of 7.5 cfs from May 1 through August 31, and of 3.25 cfs from September 1 to April 30.

In the absence of an incremental habitat protection model, such as that provided by the FWS's Instream Flow Incremental Methodology (IFIM), we believe a conservative level of protection is needed, to ensure adequate habitat for the fish community. The R2CROSS analysis recommended by the resource agencies is a conservative estimate of the minimal protection afforded to



aquatic habitat in the bypassed reach from the calculated flow. It is not, however, the most conservative approach.

To complete our examination of the minimum flow issue: First, we compare the results from the HQI, and R2CROSS, to the Tennant Method. Then secondly, we examine the differences in stream habitat between the different reaches (1) Clear Lake to the forebay and (2) the bypass reach.

The Tennant Method (1975) uses a correlation between the health of aquatic habitat and percentages of mean annual flow. The Tennant Method allows an analysis of seasonal biological requirements by separating the year into two 6-month periods as shown in Table 2. Public Service's proposed 2 cfs (Sept-Apr) and 4 cfs (May-Aug) calculate to about 8 percent and 15 percent of the average annual flow, less than Tennant's biseasonal recommendations for sustaining fair survival habitat for most aquatic habitat. The resource agencies proposed biseasonal flow of 3.25 cfs (Sept-Apr) and 7.5 cfs (May-Aug) is at or above Tennant's recommendation for sustaining fair survival habitat for aquatic habitat (Table 2).

Table 2. Instream flow regimes for fishery resources in South Clear Creek using the Tennant Method (Source: the Staff)

Description of Flows	Recommended Base Flow Regimes			
	OCT-MAR		APR-SEP	
	% of MAF <sup>1</sup>	CFS	% of MAF	CFS
Outstanding	40%	10.2	60%	15.4
Excellent	30%	7.7	50%	12.8
Good	20%	5.1	40%	10.2
Fair	10%	2.6	30%	7.7
Poor or Minimum	10%	2.6	10%	2.6

<sup>1</sup> The mean annual flow at the project site is 25.6 cfs.

The Tennant Method shows that the results of the R2CROSS would provide reasonable protection for the fishery. Providing a minimum flow regime of 7.5 cfs from May 1 to August 31, and 3.25 cfs from September 1 to April 30 and drawdown requirements from Clear Lake (as discussed in Section V.2. Water Resources) would provide better instream protection to the existing aquatic

habitat and fishery resources than Public Service's proposed flows.

However, while Public Service and the resources agencies recommend flow regimes for the total project reach (from Clear Lake to below the forebay), we see distinct differences between the stream reach from Clear Lake to the forebay and the bypass reach. The differences in aquatic habitat between the two reaches are important factors in determining appropriate flow releases.

The stream reach between Clear Lake and the forebay has a gradient of 3 to 7 percent and consists of varied stream habitats -- including boulder fields, step-pools, and braided channels with beaver ponds. In streams that are dominated by high spring runoffs and cold winters, the primary food cycle may be truncated by physical conditions (Hynes 1970). Lower gradient stream sections with backwater areas supply more productive areas that can buffer these seasonal changes. It is in areas like this between Clear Lake and the forebay that flow releases influence fish productivity.

By contrast, the bypass reach isn't influenced as much by flow releases. The bypass reach is steep (13 percent stream gradient) and consists almost entirely of step-pools. In a steep step-pool system like the bypass reach, the principal fisheries habitat is maintained in pools. Humphery (1985) found that there is relatively little change in pool surface area or depth between higher and lower flows in high gradient streams, that consist primarily of step-pools.

Consequently, the ecological limiting factors of the steeper bypass reach are primarily temperature, water quality, and availability of food, rather than flow volume. Humphery (1985) concluded that these limiting rearing factors are maintained if there is an adequate turnover time of water in the pool.

#### Conclusion

As discussed earlier, the resource agencies' recommended winter flow (September 1 to April 31) of 3.25 cfs, and 7.5 cfs for the remainder of the year (May 1 to August 31) should provide fair survival habitat (Table 2) for the fishery in the reach from Clear Lake to the forebay.

Presently, Public Service releases 3 cfs from Clear Lake beginning February 1. With spring runoff typically beginning in April (after the reservoirs for Cabin Creek and Georgetown are refilled and begin spilling), flow usually exceeds the spring/summer recommendation of 7.5 cfs.



Because this minimum flow release would not affect project economics, we therefore recommend biseasonal instantaneous flows of 7.5 cfs and 3.25 cfs from Clear Lake to the forebay.

The resource agencies biseasonal flow recommendation of 7.5 cfs and 3.25 cfs in the bypass reach would cause winter powerhouse shutdowns during low-flow periods that would occur about every 2 years.

The resource agencies' had proposed a winter flow condition that would avert winter shutdowns but it was declined by Public Service. The resource agencies' subsequently withdrew this proposal from their final recommendations. We believe that this alternative has merit, and therefore we include it in our analysis. The agencies suggested that when flows were less than 4.5 cfs, Public Service could divert 1.2 cfs for generation leaving the rest of the flows in the bypass reach. Under this alternative, the project wouldn't have to be shutdown during low-flow periods and equipment wouldn't need to be winterized, which is a costly undertaking.

The impacts on the fishery from this flow reduction during the winter period would not be significant. The primary factors that limit negative effects are that the bypass reach consists of a step-pool system, where fish would aggregate in the pools, which would remain watered even during lower flow periods. In addition, the frequency of such low-flow occurrences would be roughly once every other year, and limited to a few weeks. Consequently, the fishery could withstand lower flows without difficulty.

Similarly, under Public Service's flow recommendation the primary factor protecting the fishery in the bypass is the reach consists of a step-pool system. Currently, the project's operation (1 cfs release) provides for a minimally viable fishery in the bypass reach. Public Service's proposed biseasonal flow recommendation of 2 and 4 cfs (winter/summer) provides a smaller flow enhancement than the agencies recommended 3.25 and 7.5 cfs, yet we know that habitat changes very slowly in pools, even with considerable changes in flow. Public Service's flow proposal should provide acceptable turnover time for maintaining water quality, temperature and benthic drift for resident fish populations in the pools of the bypass reach.

We discuss the cost of a minimum flow release and its effect on the project's economics in the developmental resources section. Consistency with the Arapaho and Roosevelt Resource and Land Management Plan is discussed in the Consistency with Comprehensive Plans section. Our recommendation concerning the minimum flow is discussed further in the comprehensive development and recommended alternative section.

Another minor point of concern is that the agencies' recommendations make no provision to account for conditions where inflows fall below the recommended stream flows. Their minimum flow recommendation is set in absolutes. This could result in a drawdown of Clear Lake outside of the agreed upon flow release schedule starting on February 1st. Therefore, we do not agree with this aspect of the agencies' flow recommendations. To avoid this problem, we recommend that minimum flow, or natural inflow if less, be used for releases from Clear Lake.

#### b. Gaging requirements

Gaging would be necessary to ensure compliance with the project's minimum flow recommendation and drawdown control rates for Clear Lake. Public Service proposes to install a staff gage at an accessible location between Clear Lake and the forebay to allow verification of Clear Lake flow releases. However, we don't believe that such a limited measure would accurately monitor project flow releases. The CDOW recommends a higher level of monitoring for the project. We agree with the CDOW that the monitoring needs for the project are complicated. Therefore, a monitoring plan should be developed to cover the intricacies of measuring flows at the project.

The requirements of the monitoring plan are affected by the final flow recommendation (see §VIII. Comprehensive Development and Recommended Alternative). Elements of the monitoring plan could include the following mechanisms for measuring:

- inflow into Clear Lake;

With Public Service's minimum flow release from the Cabin Creek Project being 3 cfs, or natural inflow if less, perhaps the same gage could serve both projects.

- minimum flow releases, and drawdown rates from Clear Lake;

Because the boulder field located just below Clear Lake might make it difficult to install a gage, an alternative Public Service might consider would be an acoustic velocity meter or another type of meter to measure flows within outlet pipes before discharge.

- minimum flows released into the bypass reach; and

An instream flow monitoring device is appropriate given the configuration at this site.

- a means to account for inflow from Leavenworth Creek into South Clear Creek.

With a minimum flow, or natural inflow if less, in South Clear Creek, we must account for a contribution from such a large tributary as Leavenworth Creek. In other words, even if inflow to Clear Lake is less than the minimum flow, Leavenworth Creek could be used to make-up the difference in minimum flow in the bypass reach below the forebay.

Measuring the flow from Leavenworth Creek as it enters South Clear Creek would be difficult because of beaver ponds and the braided channel with gravel bars below the confluence. Perhaps an agreement could be worked out relating Leavenworth Creek's drainage basin size to that of South Clear Creek (which is about equal size) to determine flows.

We discuss the cost of monitoring flow releases in the developmental analysis section. Gaging requirements are dependent on the final recommended flow alternative. Therefore, our recommendation concerning the need for monitoring measures is discussed further in the comprehensive development and recommended alternative section.

#### **c. Cumulative Impacts on South Clear Creek**

There are two issues that affect the South Clear Creek watershed cumulatively: reduced annual peak streamflows, and reduced daily streamflows. The resulting physical appearance and character of the stream is a product of adjustment of its boundaries to the current streamflow and sediment regime.

Stream pattern morphology is directly influenced by eight major variables including channel width, depth, velocity, discharge, channel slope, roughness of channel materials, sediment load, and sediment size (Leopold et al. 1964). A change in any one of these variables sets up a series of channel adjustments that lead to a change in the others, resulting in a channel alteration (Rosgen 1993). River form and fluvial processes evolve simultaneously and operate through mutual adjustments toward self-stabilization.

Measurements of active channel capacity (bank full) taken in the fall of 1991 indicate that the operation of the Georgetown Hydroelectric Project and Cabin Creek Pumped-storage Project together have reduced the active channel capacity below Clear Lake and below the forebay. For comparative purposes, stream channels of similar shape were used. The cross sectional area of South Clear Creek above Clear Lake is about 23.4 square feet. In the reach between Clear Lake and the forebay, the cross-sectional area has been reduced by 29 percent to 16.6 square feet. The capacity of the active channel is further reduced in the bypass reach below the forebay, where the cross sectional area has been reduced by 45 percent to 12.8 square feet, even though the

watershed area has more than doubled due to the contribution from the Leavenworth Creek drainage.

The reduction in the cross sectional area is caused by the reduced magnitude and duration of flows caused by refilling storage at Georgetown and Cabin Creek during spring runoff. One consequence of the stream reduction is a loss of area and habitat suitable for aquatic species. There is simply less habitat that is covered by water and can be occupied by aquatic life.

The 1991 hydrological study was limited in scope. To better assess the condition of the stream channel and its stability would require a longer range study. The FS 4/ recommends establishing permanent channel cross-sections, and monitoring them over the next 10 to 20 years to examine channel stability. The FS says such a study would require little cost and manpower.

FERC staff concur with the FS on the need for further stream monitoring. The findings of this monitoring should establish whether the stream channel is stable, and what stream enhancement or operational changes could be made in relation to flow releases from the Georgetown and Cabin Creek projects. The monitoring should be completed to coincide with the expiration of the Cabin Creek license in 2014.

While the bank full discharge events are important in shaping a stream's morphology, the daily streamflows have more influence on the available stream (aquatic) habitat.

Public Service's proposed higher flow releases would enhance the existing aquatic resources, but would not eliminate, cumulative impacts on aquatic habitat in relation to historic basin conditions. To look at the broader picture, we need to examine further the overlap of the affected environment between the Georgetown and Cabin Creek projects. With Cabin Creek's minimum flow release, there is clearly an operational link between the two. To further enhance the contribution to cumulative impacts would require changing the minimum instream flow releases for the watershed. To accomplish that, Cabin Creek's minimum flow releases need to be included in the analysis.

Therefore, recognizing the two project's interrelationship on aquatic resources, we recommend that any new license issued for the Georgetown Project include an article that reopens the Georgetown license for the limited purpose of considering the project's role in maintaining appropriate instream flows in the

---

4/ personal communication, Mr. Carl Chambers, Forest Hydrologist, Arapaho Roosevelt National Forest, Fort Collins, Colorado, October 5, 1993.



South Clear Creek watershed whenever the license for Project 2351 expires, is reopened, or is amended regarding instream flows in South Clear Creek.

An additional discussion covering more cumulative effects is found in section V.B.4. Threatened and Endangered Species.

#### **d. Removal of facilities from project license**

##### Green Lake

Because Public Service is proposing to maintain Green Lake as status quo, even if it is removed from the project license, no impact to the fishery is expected to occur.

The CDOW recommends that the water surface elevation of Green Lake be maintained to protect the fishery. We agree. To maintain the lake's biological productivity and avoid winter kills in Green Lake, the lake level should be maintained.

As we've said, there is the potential to affect project streamflow if Green Lake, and its related facilities (i.e., Leavenworth diversion, Green Lake Pipeline, and Green Lake dam) are removed from the project boundaries as proposed by Public Service. Therefore, since the Leavenworth diversion has the potential to affect aquatic resources in the project area, we recommend keeping these facilities in any subsequent license issued for the protection of aquatic habitat in Leavenworth Creek.

##### Murray and Silver Dollar lakes

Since the lakes are located on National Forest System lands, they ultimately would return to FS control if removed from the FERC license. If they are returned, the Forest Service would be responsible for evaluating under NEPA and other pertinent laws any permit application put forward by Public Service for continued occupancy and use of Forest lands. Given the proposals suggested by Public Service, the management direction for the area (as defined in the Forest Plan), and general Forest Service policy regarding special uses, it is likely that aspects of these lakes would change. In particular, Public Service has proposed to use these reservoirs to replace evaporative losses from their power projects along Clear Creek. By nature of the use, this scenario includes drawdown of the water, thereby fluctuating the water level.

Any management scenario that includes periodically drawing down and refilling the lakes, or lowering them permanently, would reduce or eliminate the lakes' biological productivity. A reduction in littoral habitat in these small, high elevation lakes could impact the ability of these reservoirs to maintain

their fishery. CDOW, FWS, and BLM have identified these reservoirs as excellent cutthroat trout fisheries, and have stated that they want the water surface elevations kept stable to maintain this fishery. We agree that lowering the lakes either periodically, or permanently, would have a negative impact on the fishery.

Since we recognize the value of this fishery to be substantial, our preferred alternative is that Murray and Silver Dollar lakes remain a part of the FERC license, and that the license be conditioned to require that the lakes not be drawn down.

#### **3. Terrestrial Resources**

Affected Environment: Two forest types occur in the project area: upper montane forest and subalpine forest.

The upper montane forest type is found from roughly 8,000 feet to 9,000 feet mean sea level (msl). In the valleys of the upper montane forest, willows, red alder, birches, sedges, and grasses dominate the landscape. The valley walls and ridge tops host fairly dense stands of quaking aspen, ponderosa pine, Douglas-fir, limber pine, and lodgepole pine (U.S. Department of Agriculture 1984a).

The subalpine forest type occurs from 9,000 feet to 11,000 feet msl. In the subalpine zone, limber pine, lodgepole pine, aspen, Engelmann spruce, and subalpine fir grow on the ridge tops, and sedge and grass meadows, willows, and birches grow in the valleys (U.S. Department of Agriculture 1984a).

The project includes about 15 acres of wetlands: 11 acres in the Clear Lake area and 4 acres in a bench area upstream of Green Lake. Wetland vegetation consists of species of willow, alder, aspen, sedge, and rush.

Mule deer and elk use the project area as summer range. Bighorn sheep inhabit the area east of the project. The project extends into the elevations where mountain goats range.

Smaller mammals include beaver, pine marten, Abert's squirrel, Nuttall's cottontail, snowshoe hare, and deer mice. Birds include northern three-toed woodpecker, hairy woodpecker, pygmy nuthatch, northern goshawk, and in higher elevations white-tailed ptarmigan.

## Environmental Impacts and Recommendations:

### Removal of facilities from project license

#### Green Lake

If a subsequent license is issued that doesn't include Green Lake, Public Service states that it intends to continue operating the reservoir and its recreational facilities as in the past. In that case, removing Green Lake from the Georgetown Project wouldn't affect any terrestrial resources. If, however, Public Service changes diversions from Leavenworth Creek or Green Lake's operation, there's the potential to adversely affect the shoreline vegetation of Green Lake via inundation or desiccation.

#### Murray and Silver Dollar lakes

As discussed in the Fisheries Section, any foreseeable management scenario if the reservoirs are removed from the license would probably change some aspect of these lakes. Periodic drawdowns and refilling of the lakes would adversely affect the riparian vegetation because the periodic inundation would prevent plants from successfully colonizing the shoreline. Breaching the dams would cause the lakes to return to their original sizes, leaving an unvegetated zone, until plants could colonize the new shoreline. Since Public Service's proposal is to use these lakes to replace evaporative losses on their power projects along Clear Creek, there is a high potential for future periodic drawdowns and refillings. Therefore, our preferred alternative would be that Murray and Silver Dollar lakes remain under the FERC license, and that the license be conditioned to require that the lakes not be drawn down.

Unavoidable Adverse Impacts: None.

#### 4. Threatened and Endangered Species

##### Affected Environment:

##### Listed species

No federally listed threatened or endangered species occurs in the immediate area of influence of the project (Department of the Interior 1993a). FWS says, however, that seven federally listed species depend on the water of the Platte River Basin and that evaporative water loss from water storage structures, such as the project reservoirs, is a potential impact to these species (U.S. Fish and Wildlife Service 1993b). Table 3 lists the seven species.

Table 3. Federally listed species dependent on Platte River Basin water (Source: U.S. Fish and Wildlife Service 1993b).

Common name	Scientific name	S'
least tern	<u>Sterna antillarum</u>	E
whooping crane	<u>Grus americana</u>	E
piping plover	<u>Charadrius melodus</u>	T
pallid sturgeon	<u>Scaphirhynchus albus</u>	E
American burying beetle	<u>Nicrophorus americanus</u>	E
western prairie fringed orchid	<u>Platanthera praeclara</u>	T
Ute ladies'-tresses orchid	<u>Spiranthes diluvialis</u>	T

'S' = status; E = endangered; T = threatened

Historically, the least tern was distributed over the entire Mississippi River Basin, but the birds now occur only in parts of their former range (U.S. Fish and Wildlife Service 1992a). Least terns have occasionally bred in southern Colorado, but are typically migrants in eastern Colorado. Terns breed and nest on sparsely vegetated or unvegetated riverine sandbars, consisting of dry, sandy or gravel substrate, isolated by water. The birds prey almost exclusively on small fish. See the Commission's environmental impact statement (EIS) on the relicensing of two projects on the Platte River (Federal Energy Regulatory Commission 1992) for more information on the least tern.

The only wild breeding population of whooping cranes is found in the Wood Buffalo National Park in the Northwest Territories of Canada. This flock annually migrates through a fairly narrow corridor, crossing the Platte River Valley, on its way to and from its wintering site on the Arkansas National Wildlife Refuge on the Texas coast. Wet meadows along the Platte River provide migrating whooping cranes with the food (chiefly insects, crayfish, frogs, small fish, and other small animals) needed for survival and successful reproduction. Under specific flow regimes, the Platte River generally provides whooping cranes with the required open expanse for nightly roosting. The availability of shallow, submerged sand and gravel bars appears to be a major factor determining whooping crane use of an area for roosting. FWS has designated critical habitat for the whooping crane along a 54-mile-long reach of the Platte River in Nebraska. In April 1993, the flock consisted of 79 adult birds, 15 birds hatched in 1992, and an estimated 42 subadults and



unpaired adults (U.S. Fish and Wildlife Service 1993c). See the Platte River EIS for more information on the whooping crane.

Piping plovers breed on the northern Great Plains, around the Great Lakes, and along the Atlantic coast (U.S. Fish and Wildlife Service 1986). Piping plover nesting is rare in Colorado; the birds are primarily migrants in eastern Colorado. Piping plovers nest occupy their breeding grounds from late March to August, nesting in similar habitat to least terns (U.S. Fish and Wildlife Service 1986). See the Platte River EIS for more information on the piping plover.

The pallid sturgeon's historical range was the Missouri River from Montana to the Mississippi River and the lower Mississippi River downstream of the Missouri River. They are also found in the lower Yellowstone River in Montana. During spawning, pallid sturgeons are known to stage at the mouth of the Platte River in Nebraska.

The American burying beetle was once widely distributed throughout North America, and has been reported in 32 states, the District of Columbia, and three Canadian provinces (U.S. Fish and Wildlife Service 1988). Now only two wild populations are known, one on an island off the coast of New England and the other in eastern Oklahoma (U.S. Fish and Wildlife Service 1989). An insect trapped in North Platte, Nebraska in 1988, however, was identified as a burying beetle. Breeding pairs of this beetle species bury small dead animals, on which the female lays her eggs. The beetle larvae feed on the carcass for several days before crawling off into the soil to pupate (U.S. Fish and Wildlife Service 1990). Historical records for the beetle in Nebraska indicate that the species occurred along water courses where riparian deciduous forests or scrub forests, interspersed with grassland, were the predominant habitat. The New England population occurs in an area that varies from bayberry thickets to large mowed and grazed fields. The Oklahoma population occurs in a mosaic of vegetation types ranging from deciduous and coniferous forests on slopes and ridgetops to deciduous riparian corridors and extensive pasturelands on the valley floor.

The western prairie white fringed orchid grows in wet to mesic tallgrass prairies in North Dakota, Minnesota, Iowa, Kansas, Nebraska, Missouri, and Oklahoma (U.S. Fish and Wildlife Service 1988). It occasionally grows in the Platte River floodplain. See the Platte River EIS for more information on this plant.

Ute ladies'-tresses grows in seasonally moist soils and wet meadows near springs, lakes, or perennial streams and their associated flood plains below 6,500 feet msl in certain areas of Colorado, Utah, and Nevada (U.S. Fish and Wildlife Service 1992b). FWS believes surveys are warranted for Ute ladies'-

tresses for actions that would affect suitable habitat for this plant below 6,500 feet msl along the South Platte River and its perennial tributaries as far east as Brush, Colorado. All parts of the Georgetown Project are higher than 6,500 feet msl, however, so the Ute ladies'-tresses isn't expected to grow in the project area.

#### **Species under review**

The boreal western toad (*Bufo boreas boreas*), which is a candidate for federal listing as threatened or endangered and which the FS manages as a sensitive species, uses habitat in the project area. The FS found two juvenile boreal toads in beaver ponds on South Clear Creek, between Clear Lake and the forebay.

On September 29, 1993, the Biodiversity Legal Foundation filed a petition to list the boreal western toad as a threatened or endangered species under the Endangered Species Act.

#### **Environmental Impacts and Recommendations:**

##### **a. Evaporative water losses**

About 70 percent of the estimated 2.9 million acre-feet of the historic natural flow in the Platte River Basin is removed in Colorado, Wyoming, and western Nebraska before reaching the mainstem Platte River in central Nebraska (Krapu et al. 1982). More than 250 water diversion and storage projects exist on the Platte system and have reduced the area of the river channel by 90 percent in places (Krapu et al. 1982; Currier et al. 1985). Sediment trapped behind dams no longer washes downstream to replace river-transported sediment (Lyons and Randle 1988).

The continued evaporative water loss from the project impoundments can potentially limit habitat for federally listed species that depend on the water of the Platte River Basin. We calculated the monthly evaporative losses for the five project impoundments for the ice-free period of May through September, which is the period when significant losses would occur (Table 3). 5/

As Table 4 shows, water depletions due to evaporation are small.

---

5/ During the rest of the year, there is no significant water loss, either because of ice cover on the impoundments or because of air temperatures low enough to make evaporative losses negligible.



Table 4. Evaporative losses from the five Georgetown project impoundments (Source: the staff).

Reservoir	Project Depletions (acre-feet)					
	May	June	July	Aug	Sept	Total
Clear	4.4	7.0	6.0	4.9	5.2	27.5
Green	1.9	3.0	2.5	2.1	2.2	11.7
Forebay	0.5	0.8	0.7	0.6	0.6	3.2
Murray	0.0	2.4	2.1	1.7	1.8	8.0
Silver Dollar	0.0	4.6	3.9	3.2	3.4	15.1
Total Project Depletions						65.5

To help quantify what this means to the central Platte River, we converted Tables 4's volumes lost through evaporation into flow rates, and compared those flows to the median flow at the gage at Grand Island, Nebraska, (Table 5). Table 5 shows that the project doesn't cause appreciable water losses through evaporation.

Table 5. Evaporative losses from the five Georgetown project impoundments compared to central Platte River flows (Source: the staff).

Month	Project Depletions (cfs)	Grand Island Median Flow (cfs)	Percent of Grand Island Median Flow
May	0.11	1,920	0.006
June	0.30	1,300	0.02
July	0.25	592	0.04
August	0.20	448	0.04
September	0.22	713	0.03

The loss of 65.5 acre-feet a year, however, may contribute to cumulative effects on threatened and endangered species using habitat downstream of the project. Our assessment of the impacts of this loss on the threatened and endangered species of the Platte River Valley follows.

#### Least tern and piping plover

Evaporative losses from the project reservoirs decrease flows in Clear Creek and ultimately in the Platte River. Streamflow depletions during the late March to August breeding season for the plover and tern may affect these birds' breeding success and populations in several ways: increasing mortality of chicks and young through flooding or predation; reducing breeding efficiency and breeding energetics; and reducing foraging efficiency. Streamflow depletions and incremental reduction of sediment load duration probably contribute to vegetation encroachment and forestation of open alluvial riverine habitat, affecting plover and tern nesting habitat. Streamflow depletions also reduce aquatic habitat used by the small fish on which least terns feed. Therefore, evaporative losses from the five project reservoirs may affect the threatened piping plover and the endangered least tern.

#### Whooping crane

The project depletions would have an effect on the endangered whooping crane's roosting habitat by reducing the suitability of the roosting habitat's aquatic characteristics, including water depth, water width in the channel, and the percentage of the channel that is wetted. In addition to direct impacts on physical habitat, evaporative loss from the project reservoirs likely has an incremental effect on sediment transport in the South Platte and Platte Rivers and on wet meadow hydrology that may affect whooping cranes and destroy or modify designated critical habitat. Therefore, evaporative losses from the five project reservoirs may affect the endangered whooping crane and its critical habitat.

#### Pallid sturgeon

The Platte River is the only tributary below Gavins Point Dam that originates in the Rocky Mountains and delivers runoff from snowmelt to the lower basin. Because of its importance to the lower Missouri River basin, the Platte River figures prominently in the recovery plan for the species.

Available information indicates that if pallid sturgeon spawning occurs successfully in the lower Missouri River basin, such spawning is most likely to occur in or near the lowermost segment of the Platte River. Pallid sturgeon use of the lower Platte and Missouri rivers is associated with spring flows.

Evidence suggests that use of the lower Platte River by pallid sturgeon is most likely affected by hydrological characteristics during the spring and early summer portions of the year (U.S. Fish and Wildlife Service 1992c). Reduced spring flows, caused by evaporative loss from the project reservoirs

(see Table 5), may affect a range of important variables of pallid sturgeon habitat including, but not limited to: reducing habitat diversity; altering conditions or flows at potential remaining spawning areas; reducing food sources or the ability to obtain food; or altering remaining substrates and conditions necessary for survival. Continued, and possibly enhanced, use of that segment of the Missouri River affected by the Platte River is integral to the survival and recovery of the endangered pallid sturgeon. Therefore, evaporative losses from the five project reservoirs may affect the endangered pallid sturgeon.

#### American burying beetle

The primary factor of the decline of the endangered American burying beetle is suspected to be loss and fragmentation of habitat for the small animals whose dead bodies the American burying beetle uses. Fragmentation increases edge habitat, and increased edge habitat may have increased the occurrence and density of predators and scavengers, such as the crow, raccoon, fox, opossum, and skunk, which compete with the beetle for carrion.

Water development is suggested to contribute to the decline of the beetle in Nebraska by providing water storage for irrigated agriculture. The availability of irrigation water encourages the conversion of grassland into cropland, fragmenting areas of natural habitat for the small animals whose dead bodies the beetle uses. The Georgetown Project, however, doesn't supply water for irrigated agriculture and the project's evaporative losses occur during the growing season. Therefore, the project doesn't encourage the conversion of Nebraska grassland into cropland. The project would have no effect on small animals in the Platte River Valley and thus no effect on the American burying beetle.

The evaporative loss from the project reservoirs can be considered inadvertent flow regulation. The regulation of Platte River flows for agriculture has reduced flood flows, allowing the expansion of riparian woodlands and fragmenting wet meadow habitat. It's been suggested that this fragmentation of wet meadow habitat has adversely affected the burying beetle. By extension, reduced flow in the Platte River caused by evaporative losses from the project reservoirs has allowed the expansion of riparian woodlands, fragmenting wet meadow habitat. As stated earlier, however, the beetle historically occurred along Nebraska water courses where riparian deciduous forest or scrub forest, interspersed with grassland, was the predominant habitat. Fragmentation of wet meadow habitat thus isn't expected to adversely affect the beetle. Therefore, evaporative losses from the five project reservoirs wouldn't adversely affect the endangered American burying beetle.

#### Western prairie fringed orchid

Dewatering and habitat conversion are primary factors affecting the threatened fringed orchid throughout its range. Evaporative losses from the project reservoirs since their construction between 1900 and 1905 likely contributed to and encouraged the conversion of low-lying grassland and wet meadows to other uses, such as intensive agriculture, in which the fringed orchid can't survive. The incremental and cumulative conversion, fragmentation, and dewatering of low grassland and meadow habitats may affect the fringed orchid by: (1) eliminating habitat; (2) reducing the species' range and distribution; (3) preventing or retarding dispersal, expansion, colonization, or recolonization; and (4) decreasing the resilience of isolated populations to population fluctuations caused by environmental fluctuations. Therefore, evaporative losses from the five project reservoirs may affect the threatened Western prairie fringed orchid.

#### Ute ladies'-tresses orchid

Wetlands that are potential ladies'-tresses habitat occur along the South Platte River from 6,500 feet elevation (downstream of the project) to Brush, Colorado. Evaporative losses from the project reservoirs since their construction between 1900 and 1905 likely contributed to and encouraged the conversion of wetlands to other uses, such as intensive agriculture, in which the ladies'-tresses can't survive. The incremental and cumulative conversion, fragmentation, and dewatering of wetland habitat may affect the ladies'-tresses by: (1) eliminating habitat; (2) reducing the species' range and distribution; (3) preventing or retarding dispersal, expansion, colonization, or recolonization; and (4) decreasing the resilience of isolated populations to population fluctuations caused by environmental fluctuations. Therefore, evaporative losses from the five project reservoirs may affect the threatened Ute ladies'-tresses orchid.

#### Mitigation Alternatives

There are four major alternatives to mitigate the effects of the project on threatened and endangered species. One or more of these alternatives may be necessary.

The first alternative is for Public Service to remove all its dams, so that no water is lost to evaporation from the impoundments. The consequences of this alternative would be: (1) no cumulative effect on threatened and endangered species downstream from the project; (2) loss of the project's energy production; (3) replacement of the project's energy production by a fossil-fueled plant; (4) loss of wetlands adjacent to Clear Lake; (5) loss of the aesthetic, recreational, and socioeconomic



benefits of the impoundments; and (6) destruction of the Georgetown Historic Hydroelectric District and adverse effects on the Georgetown-Silver Plume National Historic Landmark. Because of the thousands of water rights downstream of the Georgetown Project, it's probable that the 65.5 acre-feet restored to the system would never reach the central Nebraska stretch of river. Therefore, removing the project impoundments wouldn't benefit the listed species in central Nebraska or the pallid sturgeon even further downstream.

The second alternative is for Public Service to replace the water lost from the impoundments. Both Colorado and Nebraska water law, however, place severe constraints on this alternative. For instance, under Nebraska law, only the Nebraska Game and Parks Commission or one of the state's Natural Resource Districts can request instream water rights (Neb. Rev. Stat. §46-2107). Therefore, private entities such as Public Service can't obtain an instream flow water right to benefit threatened and endangered species.

The third alternative is for Public Service to acquire, restore, and protect habitat along the Platte River. This measure would be appropriate for the terrestrial species, but not for the pallid sturgeon.

The fourth alternative is for Public Service to conduct surveys or research concerning the affected species. Surveys could identify previously unknown areas where the fringed orchid and ladies'-tresses orchid grows. Locating the orchids would provide further information about the habitat the plants use and would allow the plants to be protected. Research would benefit species by providing information that would increase the effectiveness of recovery programs for the species.

We are consulting with FWS on the project's effects on listed species. FWS' biological opinion will contain recommendations to ensure the species' protection.

#### **b. Minimum flow effects on the boreal western toad**

The boreal western toad is one of a number of amphibians whose populations appear to be declining nationally. The cause of this toad's rapid decline in the Rocky Mountains is unknown. A possible cause is increased ultraviolet radiation levels (Carey 1993).

Boreal western toads inhabit marshes, wet meadows, and the margins of streams, beaver ponds, lakes, and glacial kettle ponds in subalpine areas of Colorado. The toads are most common between 8,500 feet and 11,000 feet msl, but have been found as high as 11,860 feet msl (Hammerson 1986). They've been reported to spend the winter in small, rock-bounded chambers next to

creeks. The toads feed on a wide variety of invertebrates, including ants, snails, beetles, spiders, and mosquitos.

These toads may breed in any body of water lacking a strong current. Eggs are laid in open water free of vegetation or in open patches within vegetated areas, at depths less than 6 inches. Beaver ponds are typical breeding habitat.

The FS collected the juvenile toads in small pools, surrounded by sedges, that are near and hydraulically connected to South Clear Creek. Increasing the minimum flow in South Clear Creek, as discussed in the fisheries section, wouldn't adversely affect the off-channel pools within the floodplain. Therefore, issuing a subsequent license with the staff's recommended minimum flow requirement wouldn't adversely affect the boreal western toad.

#### **c. Removal of facilities from project license**

If we issued a license that excludes Murray and Silver Dollar lakes and the FS makes Public Service remove the dams, two natural lakes, smaller than the impoundments, would result. Water would still evaporate from the lakes, but the evaporative loss would no longer be the result of human activities. The evaporative losses from the three remaining reservoirs would continue to occur and the six listed species would experience the effects of that smaller loss.

If Murray and Silver Dollar lakes are excluded from the license and the FS allows Public Service to use the lakes to replace reservoir evaporation at the Cabin Creek Project, there would still be five reservoirs depleting water from the Platte River system by evaporation. The listed species would continue to experience the effects of that loss.

If we issued a license that excluded Green Lake, the FS couldn't make Public Service remove the dam because the dam and reservoir are on private land (figure 2). Potential changes in operation of Clear Lake wouldn't affect evaporative loss from the lake, so the listed species would continue to experience the effects of that loss.

Excluding Murray and Silver Dollar lakes from the license wouldn't adversely affect the boreal toads' off-channel pools within the South Clear Creek floodplain. Under present conditions, the outlet works are inoperative and the lakes overflow downstream. If the FS made Public Service remove the dams, the smaller natural lakes would continue to overflow and the hydrology of downstream reaches wouldn't be altered. If Public Service used the two reservoirs' storage to replace reservoir evaporation losses at the Cabin Creek Project, Public Service would maintain the required releases downstream of the



lower Cabin Creek reservoir and Clear Lake and the hydrology of the off-channel pools wouldn't change.

If Green Lake were excluded from the license, Public Service could use the storage during low-flow periods--usually the winter--to generate power. Leavenworth Creek flows into South Clear Creek downstream of the area in which the FS found the boreal western toads. Therefore, any increased diversions from Leavenworth Creek into Green Lake to generate power wouldn't affect the toads' habitat. The outlet from Green Lake discharges into South Clear Creek upstream from the off-channel pools. Use of Green Lake's storage for power generation during low-flow periods would thus entail higher flows in the creek than occur now. Public Service wouldn't discharge more water into the creek, however, than the 36-cfs pipeline at the forebay can carry. Boreal western toads spend the winter in rock-bound chambers next to creeks. Therefore, higher than normal flows during the winter may cause hibernating toads to drown.

## 5. Cultural Resources

Affected Environment: Public Service conducted a cultural resources survey of the project area (Public Service of Colorado 1991; Tate et al. 1991). Two historic districts were identified: (1) the Georgetown Hydroelectric Historic District (District), which is eligible for inclusion in the National Register of Historic Places (Register); and (2) the Georgetown-Silver Plume National Historic Landmark (Landmark), which is listed on the Register.

The District contains five sites: (1) the project's powerhouse and penstock, (2) the forebay dam and reservoir, (3) Clear Lake dam and reservoir, (4) Silver Dollar Lake dam, reservoir, and ditch, and (5) Murray Lake dam and reservoir. The project's substation and control building is of recent construction and therefore not historically significant and not a component of the District.

The survey did not assess the historical significance of Green Lake dam and reservoir or the Green Lake ditch (Leavenworth diversion pipeline). The sites may be historically significant components of the District.

There are three sites of the Landmark in the project area: (a) the Georgetown Water Works, (b) a portion of the Chicago Lake Wagon Road, and (c) a portion of the Colorado Central Railroad grade. The portions of the wagon road and the railroad grade in the project area do not retain historical integrity.

The Landmark was originally listed on the Register in 1966, and contains over 200 historic sites. The sites are primarily

buildings documenting the history of the Georgetown area from late nineteenth to the early twentieth century.

Public Service has not evaluated whether the District should be part of the Landmark. The District and Landmark both document the same period in the local history of the area, and it is possible that we should be defining one historical entity, the Landmark, rather than two.

The project facilities in the District were constructed primarily between 1900 and 1905, and have been in continuous operation since 1906. Public Service acquired the project in 1924.

The project facilities are significant primarily because they made an important contribution, through the production of electrical power, to the economic development of the Georgetown area during the early part of the twentieth century; as a group, they retain their historical integrity; and, together with the Landmark, they provide physical documentation of the area's history.

The survey did not locate any prehistoric sites.

## Environmental Impacts and Recommendations:

### a. Removal of facilities from project license

The SHPO (Hartmann 1991) states that continued operation of the project would have no effect on the District and Landmark sites in the project area. The SHPO did not attach any conditions to this determination. The SHPO does not mention deletion of Silver Dollar Lake dam, reservoir, and ditch, and Murray Lake dam and reservoir from the project, and may not be aware that Public Service proposes to delete these facilities from the project.

We do not concur with the SHPO's "no effect" determination. An adverse effect to the District facilities would occur with Public Service's proposal, according to the regulations of the Council for interpreting the National Historic Preservation Act. The Council says that an undertaking is considered to have an adverse effect when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association, including the transfer, lease, or sale of the property (Advisory Council on Historic Preservation 1986).

Specifically, the following adverse effects would occur:

- (1) The facilities proposed for removal from the project [i.e., Silver Dollar Lake dam, reservoir, and ditch, Murray Lake

dam and reservoir, Green Lake dam and reservoir, and Green Lake ditch (Leavenworth diversion pipeline)] may be subject to modification by new owners or administrators once removed from the license, resulting in an adverse effect on their historical integrity. Adverse effects could take a variety of forms, and range from deterioration of the facilities from lack of maintenance to dam removal and returning the reservoirs to natural habitat.

- (2) Future repair and maintenance work, on both those facilities left in the project and those taken out, may affect the historical integrity of the facilities, unless special care is taken to avoid or minimize such effects. Differential treatment of District facilities by separate administrative entities inside and out of the project may result in adverse effects. Specifically, the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings (Department of the Interior 1983) may not be applied to facilities removed from the project, or in the same manner if applied. Failure to apply these standards and guidelines or apply them in a consistent manner may result in significant alteration of the historical attributes of the facilities. Consistency of application is especially important for this project, where the District is the significant historical entity and not the individual facilities themselves.
- (3) More than half of the District facilities would be removed from the project, if Green Lake dam and reservoir and the Green Lake ditch (Leavenworth pipeline) are included in the District. The District facilities are not significant on an individual basis but only as a group. Modification of any one facility would have adverse effects on the group as a whole.
- (4) These effects may have an adverse effect on the Landmark. The District and the Landmark are located next to each other, and document the same period of history. Further investigation may show that the District is a component of the Landmark.

To license Public Service's proposal, Public Service must develop and implement a cultural resources management plan to ensure that repair and maintenance do not have an adverse effect on the facilities, and that whoever administers the facilities taken out of the project does the same and does not make modifications without further review pursuant to the National Historic Preservation Act, through the regulations of the Council.

The plan must contain other provisions to establish a museum and open the powerhouse for tours, as Public Service says it is

willing to do, and to protect any archeological or historic sites discovered during project operation. Tours and a museum would make the public aware of the significance of the District, and help compensate for adverse effects on the District or other cultural resources from project repair and maintenance work and continued operation.

Further, the plan must require investigations sufficient to determine whether Green Lake dam and reservoir and Green Lake ditch (Leavenworth pipeline) are part of the District, and to determine the relationship of the District to the Landmark, how adverse effects of the project may impact the Landmark, and necessary mitigative measures.

The cultural resources management plan must also be prepared and implemented pursuant to a memorandum of the agreement (MOA) according to the guidance document "Preparing Agreement Documents" (Advisory Council on Historic Preservation 1989), and parties to the MOA should be Public Service, the SHPO, the Commission, the FS, any entity that takes over administration or ownership of the District's sites deleted from the proposed project, and the Council. The MOA must be prepared and executed prior to issuance of a license for the proposed project, to comply with the National Historic Preservation Act, and implemented as a condition of any license issued for the project.

An MOA is necessary because of the complexities of the situation and the potential adverse effect of Public Service's proposed action, specifically, the removal of some District facilities from the project, possible modification of the facilities, new administrators or owners of the facilities who should be parties to implementation of a cultural resources management plan to protect the facilities, and possible effects on the Landmark.

#### b. Retaining facilities within the project license

Our preferred alternative would have no effect on the historical integrity of the District and the Landmark, if a license condition is required to protect the historic properties from maintenance and repair work during project operation. It retains Silver Dollar Lake dam, reservoir, and ditch, Murray Lake dam and reservoir, Green Lake dam and reservoir, and Green Lake ditch, within the project, and therefore eliminates adverse effects (1), (3), and (4) in part noted for Public Service's proposal.

Our alternative requires implementation of a cultural resources management plan to avoid and mitigate impacts of continued operation of the project. Future repair and maintenance work may affect the historical integrity of the facilities. Therefore, the plan would require that Public



Service implement measures to maintain and repair the District facilities according to acceptable historic preservation standards, specifically the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings (U.S. Department of the Interior 1983) and the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (48 FR 44716-44742), and base the measures on the recommendations of the SHPO, the FS, the BLM, and the Council. These measures would eliminate adverse effect (2) and remaining concerns about adverse effect (4).

The cultural resources management plan would also require Public Service to establish a museum and open the powerhouse for tours, as Public Service says it is willing to do, and to protect any archeological or historic sites discovered during project operation. As noted for Public Service's proposal, tours and a museum would make the public aware of the significance of the District, and help compensate for any possible adverse effects on the District or other cultural resources from project repair and maintenance work and continued operation. The plan would also require determining whether Green Lake dam and reservoir and Green Lake ditch (Leavenworth pipeline) are part of the District.

Besides eliminating adverse effects, our alternative simplifies the cultural resources protection process. Rather than having several entities managing the District facilities, and several agencies monitoring compliance, there is simply Public Service and the Commission doing such work. Further, because the license would be conditioned on implementation of a cultural resources management plan, continued operation would have no effect on the District and Landmark, and, therefore, an MOA would not be necessary. A cultural resources management plan based on the recommendations of the SHPO, the FS, the BLM, and Council is sufficient.

Under this alternative, we would: (1) prepare a cultural resources management plan for review by Public Service, the SHPO, the FS, the BLM, and the Council; (2) make revisions based on the comments of these agencies and then seek the Council's comments pursuant to their regulations on the effects of the project on the District and the Landmark; and (3) require implementation of the plan as a condition of any license issued for the project, taking account of the Council's comments.

Unavoidable Adverse Impacts: None.

#### 6. Recreation

Affected Environment: In the past 40 years, recreation has become an important resource for the historic mining towns of the Clear Creek area, especially Central City and Georgetown. With the construction of Interstate 70 and U.S. 40, people have been

able to live in the Clear Creek basin, close to ski areas and other attractions, and commute to Denver (Forest Service 1984b).

The Georgetown project is in the midst of a very popular and heavily used recreation area. Less than an hour's drive from Denver, the town of Georgetown is easily reached via Interstate 70. Georgetown itself is an attraction due to its mining history and 1800's architecture.

Both Georgetown and the project are on the Guanella Pass Scenic and Historic Byway; a state-designated half-day auto tour loop beginning and ending in Denver. In the project area, the Byway provides easy access to an alpine environment and the Continental Divide, along with outstanding views of South Clear Creek Valley.

Three project reservoirs are open to the public for recreation: Clear, Murray, and Silver Dollar Lakes. Clear Lake, about 1.3 miles upstream of the project forebay, is stocked by the CDOW with catchable-size rainbow trout, and has developed recreation facilities. Murray and Silver Dollar Lakes are several miles upstream in the drainage at an elevation of about 12,000 feet, and are accessible via a 2-mile-long trail off of Guanella Pass Road. A short portion of this trail crosses private land at Naylor Lake.

Two project lakes are currently not open to the public - Green Lake and the forebay. Use of the forebay is discouraged because it's the source of the Georgetown's drinking water. However, the BLM manages lands to the south and east of the forebay, and uses a stream ford just upstream of the forebay, on Public Service land, for vehicular access. This ford has also been used by the public to access the BLM lands. To protect its water supply, Georgetown has placed "No Trespassing" signs around the reservoir and stream ford.

At Green Lake, Public Service maintains a private lodge that is used as a meeting facility, and an adjacent caretakers' residence. Existing recreation facilities and their relationship to project features are shown on figure 2.

Most recreation opportunities at the project are supported by facilities under either Public Service or FS management (see Table 6). Public Service reports that the two campgrounds and the facilities at Clear Lake are used at or near capacity on weekends from Memorial Day through Labor Day. Based on FS visitor counts, the trail to Murray and Silver Dollar lakes is used by over 4,000 persons per year (Public Service Company of



Colorado 1992). 6/ Murray and Silver Dollar lakes reportedly support good angling for cutthroat trout (Colorado Division of Wildlife 1993).

Table 6. Existing recreation opportunities and facilities in the Georgetown Project area.

ACTIVITY	FACILITY	OWNER	OPERATOR
Lakeshore Fishing	Clear Lake: 40-car parking area, restrooms, and 4 picnic sites.	PSCC <sup>1</sup>	PSCC and FS
Camping	Clear Lake and Guanella Pass Campgrounds: 40 sites.	FS	FS
Stream Fishing, Hiking	South Clear Creek: No facilities, but it is open to the public for fishing.	PSCC FS & BLM Private	N/A
Hike-in Fishing, Nordic Skiing, Hiking	Murray and Silver Dollar Lakes, Trail and Trailhead (10-car parking area).	FS	FS

<sup>1</sup>PSCC = Public Service

#### Environmental Impacts and Recommendations:

##### **a. Forebay reservoir**

Public Service proposes to continue to allow vehicular access to BLM land east of the forebay. If, in the future, vehicular access is blocked due to water supply concerns, Public Service would still allow the BLM to access this land.

Both BLM and the FS recommend that non-motorized public access for recreation be provided across South Clear Creek to BLM lands east of the forebay. BLM further requests that the existing vehicular access be maintained for public agencies' management, emergencies, and fire control.

Based on comments from the Mayor, Georgetown's chief concern about public use at the forebay is four-wheel-drive (FWD) vehicles. Apparently, FWD vehicles have been observed operating at the south end of the forebay, and Georgetown is concerned that

such use could result in oil, or some other fluid, contaminating their water supply (personal notes, April 27, 1993, meeting, Georgetown, Colorado).

We believe that the town of Georgetown has a valid concern. Use of the south end of the forebay by private FWD vehicles could result in a mishap (hanging-up on uneven terrain, broken oil pan, etc.). It's foreseeable that such a mishap could release automotive fluids into the reservoir. We also agree with the FS and the BLM that public non-motorized access should still be permitted. South Clear Creek between Clear Lake and the forebay is a managed recreational fishery with informal existing pull-offs for off-street parking. Public access, if managed, could be encouraged while still protecting Georgetown's water supply. Encouraging such access would help meet a high need for hiking, mountain biking, and nature study in the Denver Metropolitan Planning Region (Region 3) identified in the Statewide Comprehensive Recreation Plan (SCORP), (Colorado Division of Parks and Recreation 1986).

Therefore, we recommend that Public Service, in consultation with Georgetown, the BLM, the FS, and the CDOW, prepare and file a plan for restricting public access across South Clear Creek at the south end of the forebay to non-motorized access. Such a plan should consider signage, vehicle barriers, and/or gates. However, the plan should encourage public, non-motorized use of this area, and should provide a means for land managing agency vehicles to access lands on the east side of the forebay. This alternative, a combination of Public Service's, the FS's, and the BLM's recommendations, would protect Georgetown's water supply while still allowing public use of the resources on the east side of the forebay. We estimate this measure would cost a maximum of about \$2,000.

##### **b. Green Lake - public access**

As discussed above, Public Service wants Green Lake removed from the project's license. If the lake stays in the license, Public Service would continue to provide access only to employees and guests using the private lodge. Public Service considers Green Lake unsuitable for public use because of a lack of adequate space for parking, its relationship to Georgetown's water supply intake, and steep, rocky shorelines. They note that

6/ The Forest Service counted 497 users on 42 days (weekdays and weekends) from July 4, 1991 to July 11, 1992. Total annual use was estimated by determining an average daily use (497 users + 42 days = 11.83 users per day, rounded to 12). Daily use was then multiplied by 365 days per year for a total of 4,380 annual users.

Commission staff confirmed this position in a past decision. 7/

The CDOW and the FWS recommend that Green Lake remain in the license and be opened to public use. The FWS recommends that a recreation plan be prepared for the lake. The CDOW requests that fishing, non-motorized boating, and other "appropriate" recreation be allowed. They feel that concerns over water supply impacts are unfounded since there is heavy fishing use upstream of the lake. The CDOW notes that they manage a number of terminal water supply reservoirs where full public access is allowed, including motorized boating. They further note that the rocky terrain around Green Lake is common to many Colorado reservoirs that are open to the public.

The CDOW believes that a parking area could easily be constructed across the road from the south end of the lake which would also provide more access to nearby Clear Lake. From this area, the CDOW recommends an access trail be constructed to the lake's east shore, and that other facilities such as toilets, picnic tables, disabled access and interpretive signs be installed. The CDOW believes such development is justified based on the heavy demand for fishing in the Denver Metropolitan area and evidence that Green Lake was a popular public fishery in the 1800's (Wiltzius 1985). 8/

Under Public Service's proposal to remove Green Lake from the license, a significant potential public recreational opportunity would be lost. As Public Service has stated, the recreation facilities at nearby Clear Lake are used at or near capacity on weekends from Memorial Day through Labor Day. Public Service acknowledges that the need for more recreational opportunities in this area exists, but feels that the small size

7/ During their Environmental and Public Use Inspection on October 2, 1989, the Commission's San Francisco Regional Office (SFRO) noted that Public Service's practice of restricting public access to Green Lake was inconsistent with the project license. In a letter dated June 29, 1990, the Commission's Division of Project Compliance and Administration (DPCA) questioned this practice. Public Service responded by letter dated May 18, 1990, stating that the lake is upstream of Georgetown's water supply intake and citing the constraints that the terrain places on access. In a letter dated June 29, 1990, the DPCA agreed with Public Service, primarily "in order to prevent contamination of a municipal water supply".

8/ During the late 1800's, Green Lake was the property of a Mr. William H. Cushman. He was a banker who had an interest in fish culture. Mr. Cushman had a hatchery at Green lake, stocked the lake with trout and salmon, and operated the lodge and lake as a resort.

of the project area and project lakes limits opportunities to those provided now (Public Service Company of Colorado 1992). We disagree, and feel that Green Lake could help meet a high need for shore fishing identified in the SCORP for Region 3 (Colorado Division of Parks and Recreation 1986), and should, therefore, remain in the project's license. We also find nothing about the rockiness and slope of the lakes' shoreline that would preclude public use.

Finally, we find it hard to make a case for not allowing public use of Green Lake based on water supply protection. As we stated above, Georgetown's main concern about their water supply is four-wheel drive vehicle use downstream at the project forebay's south end. Our recommended recreation plan for the forebay area addresses this concern. No information has been presented that indicates that recreational use of South Clear Creek or Clear Lake, both upstream of Georgetown's water intake, has had any impact on Georgetown's water supply.

We believe that Green Lake could attract around 940 users per summer season if it is open to the public. We base this estimate on the level of use that nearby Clear Lake is receiving, which is at or near capacity on weekends during the summer season. 9/ This is a conservative estimate since Green Lake would likely attract some use during the spring and fall months. We assume that fishing would be the chief recreational activity at Green Lake if it is open to the public.

Various methods have been used to estimate the value of recreational fishing. The FS has a standard unit day value of \$11.00 for sport fishing in the Rocky Mountain Region (Walsh 1986). Walsh, 1986, also reviewed nine studies, seven of which were conducted in western states, that used both the Travel Cost and Contingency Valuation Methods for estimating the value of cold water fishing. These studies found a range of values

9/ Clear Lake has a parking capacity of about 40 vehicles. Assuming that the lake is used at or near capacity on weekends from Memorial Day through Labor Day, there are about 40 vehicles each weekend day for 15 weekends per summer season. Using a FS standard of 2.7 persons per vehicle (Public Service 1992a), about 3,240 people are using Clear Lake on summer weekends (40 vehicles x 15 weekends x 2 days/weekend x 2.7 persons/vehicle). Based on use data collected at the Murray and Silver Dollar trailhead nearby, 84% of recreational use in this area comes on weekends; 16% on weekdays. Adding an additional 16% to the weekend use estimate of 3,240 gives a total of about 3,758 summer users at Clear Lake. If a ten-car parking area was provided at Green Lake ( $\frac{1}{4}$  the capacity of Clear Lake's), we estimate that the lake would attract about one-fourth the number of users ( $3,758 \div 4 = 939.5$ , rounded to 940).



between \$9.00 and \$18.00 per day for cold water fishing or a \$13.50 average. Based on this, we believe that the value of the additional recreation that Green Lake would attract would be between \$11.00 and \$13.50 per day or \$10,340 to \$12,690 per year.

We, therefore, recommend that Public Service, in consultation with Georgetown, the FS and the CDOW, prepare a plan for opening Green Lake to public use. At a minimum, the plan should include signage, parking, and restrooms.

As a cost-saving option, the existing facilities at Green Lake, with some modification, could satisfy this requirement. Since over 80 percent of recreational use in the project area comes on weekends, we don't foresee a significant conflict with Public Service's use of the existing lodge and parking area for meetings and seminars during the week. If this option is not feasible, then a separate parking area and restroom should be developed. The FS estimates that a 10-car parking area and restroom (with accessible vault toilets) would cost about \$30,000. 10/

#### c. Boating - Clear Lake and Green Lake

Public Service would continue to prohibit boating on these lakes. They did consider allowing non-motorized boating, but feel that Clear Lake is unsuitable for such use because:

- steep, rocky shorelines make access difficult or dangerous;
- shoreline conditions make rescue difficult;
- the area is subject to sudden, severe winds; and
- Clear Creek County is concerned about accidents due to trailering of boats on Guanella Pass Road.

Public Service also notes that non-motorized boating is allowed on nearby Georgetown Lake (located just North of Georgetown), and states that, even though Georgetown Lake is more suitable than Clear Lake, it is rarely used for boating.

The CDOW recommends that non-motorized boating be allowed at Clear Lake, and that access facilities for the disabled be developed. The FS recommends that Public Service consider allowing non-motorized boating on the lake.

We agree that trailering boats up to the project area is not advisable considering the narrow, winding, steep nature of Guanella Pass Road. However, it would be reasonable to allow

---

10/ personal communication, Adam Burnett, Recreation Forester, Arapaho National Forest, Clear Creek Ranger District, Idaho Springs, Colorado, May 26, 1993).

car-top, non-motorized boats on both Green and Clear Lakes. Such boats can be carried to the water's edge and need no special launching area. We find nothing unusual about these lakes that would make rescue any more or less difficult than at any other small lake. Also, with no motors involved, there would be no chance of lubricants or other automotive-type fluids entering the water.

We recommend that Public Service, when designing signage for Clear and Green Lakes, show car-top, non-motorized boating as an opportunity that is available at both lakes. There would be no cost for this enhancement, and the public would benefit from having an additional recreational opportunity at the project.

#### d. Clear Lake - Facilities

Public Service would improve existing recreation facilities at Clear Lake by:

- Designating parking for the disabled at both parking areas.
- Providing disabled access to a picnic table and charcoal grill near the lower parking area.
- Installing a sign informing the disabled of accessible fishing opportunities at Georgetown Lake.
- Installing an interpretive sign at the lower parking area.
- Replacing existing picnic tables with FS-approved tables.
- Repairing or replacing charcoal grills as needed.

Public Service estimates that these measures would cost about \$5,290. 11/

The FS recommends enhancements be made to the facilities at Clear Lake. They are:

- Install an interpretive sign at the lower parking area that gives information about the surrounding area.
- Conduct an independent feasibility study to determine if Clear Lake can be accessible for fishing to people with disabilities.
- Ensure that restrooms meet current FS access standards.
- Replace picnic tables with a FS-approved design, one of which is accessible to the disabled.
- Replace unusable barbecue grill components.
- Regrade an existing mound of soil at the parking area, and revegetate the surrounding hillside to improve the site's aesthetics.

---

11/ Telefax from Mr. Richard A. Petzke, Project Licensing Specialist, Public Service Company of Colorado, Denver, Colorado, June 1, 1993.



Several of these conditions match what Public Service is proposing for Clear Lake, i.e., upgrading picnic tables and grills, plus installing interpretive signage. We estimate that the total cost of these three enhancements would be about \$3,540. 12/

Regrading the mound of soil and replanting the adjacent hillside with an appropriate seed mixture would improve the site's aesthetics and would not significantly add to the cost of the above enhancements. We agree that these items should be provided. They are basic operation and maintenance type measures. Further, picnicking is the highest need activity identified for Region 3 in the SCORP (Colorado Division of Parks and Recreation 1986). Since Public Service states that they upgraded the restrooms for disabled access in 1988 (Public Service Company of Colorado 1992), they should conduct an on-site inspection with the FS to verify that the restrooms meet current standards.

Public Service's position in making the shoreline of Clear Lake accessible to the disabled was that they did consider the construction of a hard-surface trail from the "Fisherman's Parking Area" to the shoreline, but ruled it out because its length (1,200 feet), grade (5%), and number of switchbacks made the cost prohibitive (Public Service Company of Colorado 1992). Public Service estimates that this type of pathway would cost about \$46,000. 13/ They do note, however, that other Clear Lake facilities are being used by the disabled.

Given the level of use that Clear Lake attracts, and the Americans with Disabilities Act of 1990 requirement that no individual, on the basis of disability, be discriminated from full and equal enjoyment of places of public accommodation, we believe that the FS recommendation that Public Service conduct further analysis is reasonable. Various levels of accessibility have been identified for trails that allow for a range of grades (up to 12.5%) and less costly surface requirements (U.S. Department of Agriculture and Interior 1990). Using a gravel surface, for instance, and some sections with steeper grades could lessen the number of switchbacks needed, and would cut the cost of the trail considerably. We estimate that an accessible

---

12/ This is based on the current cost that the Forest Service reports for picnic tables, grills, and signage in this region (personal communication, Adam Burnett, Recreation Forester, Arapaho National Forest, Clear Creek Ranger District, Idaho Springs, Colorado, May 25, 1992).

13/ Telefax from Mr. Richard A. Petzke, Project Licensing Specialist, Public Service Company of Colorado, Denver, Colorado, June 1, 1993.

trail could be developed for about \$22,000, using a FS estimate of \$19.00 to \$25.00 per foot. 14/

Therefore, Public Service should, in consultation with the FS, study a range of alternative routes and surfaces that would provide disabled access to the Clear Lake shoreline, and should file a plan for providing such access.

#### **e. Murray and Silver Dollar Lakes**

As with Green Lake, Public Service wants Murray and Silver Dollar Lakes removed from the project's license. Public Service believes that any concerns about public use, if the lakes are removed, are unfounded. Public Service says that since the lakes are on Forest land, the lakes would be subject to a FS special use permit regardless of whether or not they're in a FERC license. Public Service believes that the FS would condition the special use permits to protect recreation resources.

The CDOW recommends that Murray and Silver Dollar Lakes remain in the license and stay open to public use, and that the area around the lakes be "cleaned-up". This clean-up is in reference to exposed metal remnants found around the dams at the lakes. The FWS also recommends that the lakes remain in the license and open to public use.

The FS recommends that the trail to Murray and Silver Dollar Lakes be rerouted around private land or that a right-of-way be obtained across this land if the reservoirs stay in the license. They also request that portions of the project on FS land be kept in orderly repair and as clean as possible.

An August 16, 1993, letter from the Commission's San Francisco Regional Office requires Public Service to clean-up the area around Murray and Silver Dollar dams, and to remove a number of metal remnants at other locations. In addition, standard license and FS permit conditions would require that Public Service dispose of all temporary structures, unused timber, brush, refuse, or other material unnecessary for the project. Therefore, no further action is needed regarding the clean-up of the area.

Rerouting the Murray and Silver Dollar Lakes trail around the private property at Naylor Lake or obtaining an access easement across this property would be a public benefit since it

---

14/ This assumes the trail would be about 1,000 feet long at an average cost of \$22.00 per foot, using a gravel surface from an existing parking area at Clear Lake (personal communication, Adam Burnett, Recreation Forester, Arapaho National Forest, Clear Creek Ranger District, Idaho Springs, Colorado, May 26, 1993).

would ensure long-term public access to the lakes and nearby alpine areas. As stated above, this trail attracts about 4,000 users each year. If the owner of the Naylor Lake property decides to close his property sometime in the future, public use of this area would decline. Therefore, if the lakes remain in the license, Public Service should, in consultation with the FS, reroute the trail to avoid crossing private property. The FS estimates that rerouting the trail could be done for about \$10,000. 15/

Since the lakes are located on National Forest System lands, they ultimately would return to FS control if removed from the FERC license. If they are returned, there is a probability that aspects of the reservoirs would change, including the potential for drawdown of the water level. We do know that any management scenario that includes drawing down the lakes would have an adverse effect on recreational opportunities through impacts on the trout fishery (see section V.B.2.). Aesthetics would also be adversely impacted since drawing down the lakes would have an obvious ring around the shoreline that would take some time to revegate at that high altitude.

As described earlier, the project area and basin are heavily used for outdoor recreation. If Murray and Silver Dollar lakes are removed from the project license, present and future recreational opportunities could be adversely affected. Therefore, from a recreational or public use standpoint, our preferred alternative would be to maintain the lakes' present status, particularly in terms of no water level fluctuation, by retaining the lakes with the FERC license conditioned not to allow drawdown.

Unavoidable Adverse Impacts: None.

#### 7. Land Use

Affected Environment: Land in and around the project is under both public and private ownership. Public land at the project includes portions (about 20 acres) of the Forest and areas (about 2.0 acres) managed by the BLM (see Appendix A). Private land in the area consists mainly of homesteads and mining claims that have been converted to summer homes or private camps.

Forest land management at the project focuses on developed recreation (campgrounds, picnic areas, and trailheads) at or near Clear Lake, and dispersed recreation (hiking, cross-country skiing, and fishing) along South Clear Creek and in the area

15/ personal communication, Adam Burnett, Recreation Forester, Arapaho National Forest, Clear Creek Ranger District, Idaho Springs, Colorado, May 25, 1993.

around Murray and Silver Dollar Lakes. For developed recreation sites, the FS's management emphasis is on designing facilities and access to provide site protection, efficient maintenance, user convenience, and safety (Forest Service 1984b). For dispersed recreation, specifically semi-primitive recreation, the FS's emphasis is on managing use to allow low to moderate contact between groups and individuals (Forest Service 1984b).

BLM's management of their land at the project is focused on making boundary adjustments by sale or exchange to improve management efficiency. BLM lands at the project area are generally located east of South Clear Creek from Green Lake downstream to Georgetown. BLM's general policy is to transfer this land to the FS (U.S. Department of Interior 1986). Such a land transfer is currently under review by the U.S. Congress.

Private lands in the project area are zoned by Clear Creek County and the town of Georgetown for mining and rural residential use.

Environmental Impacts and Recommendations: Under Public Service's proposal, there would be little impact on current land use patterns. Since Green Lake is currently not open to the public, removing it from the license would not affect public use of the shoreline. Public Service would continue to use their facilities at the lake for meetings.

Removing Murray and Silver Dollar Lakes from the license, since they are on FS land, would also not significantly impact land use patterns -- the same types of activities would likely still occur in and around the lakes. However, as we've said, the level of recreational use at the lakes could be significantly affected depending on how the lakes are managed.

Continuing to allow vehicular access by the BLM to their lands east of the forebay via an existing stream ford at the project as recommended by Public Service, the BLM, the FS, and staff would not result in a significant change in land use. Actively managing access across this ford area for non-motorized use and restricting vehicular access could result in a shift away from FWD use of the area to more pedestrian-oriented use. However, this measure, geared to protect Georgetown's water supply, would mainly formalize Georgetown's current practice of discouraging vehicular use of the south end of the forebay.

If Green Lake is opened to the public for recreation, as we and the CDOW recommend, the lake's shoreline would attract additional recreational use. However, we do not view this as a negative. Nearby Clear Lake is heavily used by the public and no data has been presented indicating that such use is having an adverse impact on that lake's shoreline.



Improving existing recreational facilities at Clear Lake as recommended by Public Service, the agencies, and staff, would simply facilitate existing land uses, and would not result in a significant change in land use patterns. Although these facilities are heavily used, no information has been presented that would indicate that the land area around the lake is nearing its carrying capacity.

Unavoidable Adverse Impacts: None.

#### C. No-Action Alternative

Under the no-action alternative the project would continue to operate as required by the existing license. The existing situation, as described in the Affected Environment portions of this document would remain unchanged, and the issues identified under Section III, B. Alternative Environmental Measures would not occur. Project stream reaches would not benefit from increasing instream flow releases to enhance the fishery and the riparian habitat; no additional recreational opportunities would be provided; and the cumulative impacts of both the Georgetown and Cabin Creek Pumped Storage Project would not be evaluated.

## VI. DEVELOPMENTAL ANALYSIS

In analyzing the economic feasibility of the project for a 30-year license period, we used Public Service's alternative power cost of 1.5 cents per kWh (AIR filed July 27, 1992), escalated at 4.1 percent annually. With this alternative power cost, the existing project has a levelized net annual benefit of about 14.2 mills/kWh or \$83,730.

We looked at three enhancement measures that affect the economic benefits of the project: (1) raising the instream flow for the bypass reach, (2) requiring gages to monitor minimum flow requirements, and (3) developing and upgrading recreational facilities.

#### a. Instream flows for the bypass reach

Historically, the project produces about 5.91 GWh of energy annually. We estimate that with the resource agencies' and Public Service's minimum flow proposals, the project's annual electric energy would decrease to 4.91 GWh and 5.46 GWh, respectively.

As we've said, the minimum flow proposals cover two reaches: (1) the reach from Clear Lake dam to the forebay; and (2) the bypass reach from the forebay to the tailrace of the powerhouse. When analyzing the effects of the minimum flow proposals on power

generation, we found that the minimum flows proposed for the reach between Clear Lake and the forebay represent negligible changes compared to current project flow releases, and therefore do not affect the project's economics. The power generated by the project is mainly affected by the minimum flow proposals for the bypass reach from the forebay to the tailrace of the powerhouse. In this section, we discuss the effects of the resource agencies' minimum flow proposals for the bypass reach.

With the resource agencies' first minimum flow proposal (resource agencies #1), the plant would have to be shutdown about every other year in winter when there's not enough flow to operate the turbines and provide the recommended minimum flow in the bypass reach. The operation and maintenance cost for shutdown, startup, and winterization of the equipment is about \$43,500.

Because of this substantial cost, we looked at the resource agencies' further proposal to prevent winter shutdown of the plant. We have labeled this resource agencies #2. Under this alternative, if instream flows during the winter months (December through March) are less than 4.5 cfs, Public Service can divert 1.2 cfs for generation leaving the rest of the flows in the bypass reach including the 1 cfs for the Georgetown municipal water supply.

Under this alternative, the plant wouldn't have to be shutdown during low-flow periods and equipment wouldn't need to be winterized, thus lowering the operation and maintenance costs of the project over the license term.

With the daily and monthly flow data from USGS gage no. 06716500, we conclude that the power generated with the resource agencies' second alternative, minimum flow would not change from the power generated with the resource agencies' first flow alternative. However, with overwintering costs included, the economics are significantly different. With Public Service's, and the resource agencies' #2 and #1 minimum flow proposals, the project would lose about 12, 26, and 59 percent of its net annual benefits, respectively, compared to current operations.

In table 7, we show the effect of the instream flow alternatives on project generation and on the project's net benefits.



Table 7. Economic analysis of minimum instream flow alternatives for the Georgetown project (Source: the staff).

Proposals	Average annual generation (GWh)	Levelized net benefits (mills/kWh)	Loss in net annual benefits
PSCC <sup>1</sup> - current	5.91	14.2	-----
PSCC <sup>1</sup> - proposed	5.46	13.5	\$9,820
Resource Agencies #2	4.91	12.6	\$21,810
Resource Agencies #1	4.91	7.0	\$49,600 <sup>2</sup>

<sup>1</sup> PSCC = Public Service

<sup>2</sup> Loss includes project overwintering expenses

#### b. Gaging requirements

We estimate that the gaging requirements for monitoring minimum flow releases would cost about \$30,000 to \$50,000 with an annual operation and maintenance (O&M) cost of about \$2,400. These costs translate to a 30-year levelized annual cost of about \$7,900 to \$11,000.

#### c. Recreational enhancements

In the Recreation section of the EA, we recommend that Public Service prepare and file plans for recreational enhancements at Clear, Murray, and Silver Dollar lakes, and South Clear Creek. We estimate the cost of these enhancements to be about \$37,540 (with annual O&M costs of about \$3,754) or 30-year levelized annual cost of about \$11,090.

We also recommend in the Recreation section that Public Service prepare a plan for opening Green Lake to public use. If Public Service decides to construct new facilities instead of using the existing facilities with some modifications, the cost would be about \$30,000 (with annual O&M costs of about \$3,000) or 30-year levelized annual cost of about \$8,910.

#### Summary of economic analysis

Table 8 summarizes the environmental enhancement measures that have measurable costs. In this summary analysis, we used the maximum capital cost of \$50,000 and annual O&M costs of \$2,400 for the gaging requirement. Also for the recreational

enhancements, we used the maximum capital cost of \$67,540 and annual O&M costs of \$6,754.

Table 8. Estimated cost of environmental enhancement measures for the Georgetown Project (Source: the staff).

Enhancement Measure	Initial Cost	Annual O&M Cost (1993 dollars)	30-year Levelized Annual Cost
PSCC's minimum flow	minimal	\$33,700	\$9,820
Gaging	\$50,000	\$2,400	\$11,010
Recreation	\$67,540	\$6,754	\$20,000
TOTAL ANNUAL COST OF PSCC MINIMUM FLOW WITH STAFF'S ENHANCEMENT MEASURES			\$40,830
Agencies' #2 minimum flow	minimal	\$33,700	\$21,810
Gaging	\$50,000	\$2,400	\$11,010
Recreation	\$67,540	\$6,754	\$20,000
TOTAL ANNUAL COST OF RESOURCE AGENCIES' #2 MINIMUM FLOW WITH STAFF'S ENHANCEMENT MEASURES			\$52,820
Agencies' #1 minimum flow	minimal	\$108,000 average	\$49,600
Gaging	\$50,000	\$2,400	\$11,010
Recreation	\$67,540	\$6,754	\$20,000
TOTAL ANNUAL COST OF RESOURCE AGENCIES' #1 MINIMUM FLOW WITH STAFF'S ENHANCEMENT MEASURES			\$80,610

With Public Service's minimum flow proposal and staff's enhancement measures, the project's 30-year levelized net annual benefits would be reduced by 49 percent. For minimum flow from resource agencies' #2 and staff's enhancement measures, the project's 30-year levelized net annual benefits would be reduced by more than 63 percent. With the resource agencies' #1 minimum flow proposal and staff's enhancement measures, the project's 30-year levelized net annual benefits would be reduced by about 96 percent--leaving the project with little net benefits.

#### d. Removal of facilities from project license

Public Service proposes to exclude Silver Dollar Lake, Murray Lake, Green Lake, and the gravity pipeline from Leavenworth Creek to Green Lake from the subsequent license of the project.

Public Service has not operated Murray and Silver Dollar Lakes for over 20 years and would not be able to control any

storage from these lakes without making repairs to the outlets. Using Public Service's cost estimate of \$150,000 for repairs of the outlet works at Silver Dollar and Murray Lakes, we find that the additional annual incremental generation of 0.239 GWh (estimated by Public Service) does not justify the cost over the 30-year license period.

At Green Lake, Public Service diverts no more than 1 cfs of the spring runoff from Leavenworth Creek. However, they do not release any flows from the lake to South Clear Creek to generate power. There is only seepage from the dam at Green Lake. So the current operation of Green Lake doesn't affect power generation at the project.

## VII. CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project.

Under Section 10(a)(2), federal and state agencies filed 15 plans that address various resources in Colorado. Three plans are relevant to this project. They are discussed in greater detail below.

**Statewide Comprehensive Recreation Plan (SCORP).** The SCORP identifies picnicking, hiking, mountain biking, nature study, and shore fishing as high needs for Region 3 - where the Georgetown project is located. Boat fishing is ranked a medium need. The project, with our recommended recreation enhancements, would protect existing opportunities for all of these activities and would improve some opportunities, such as shore and boat fishing, and picnicking through new or improved facilities and/or improved signage.

**Land and Resource Management Plan - Arapaho and Roosevelt National Forests and Pawnee National Grassland (Forest Plan).**

The project falls within 4 different management prescriptions depending upon the location of the facilities:

Management Prescription 2B of the Forest Plan (pg. III-129) emphasizes dispersed recreation for roaded natural and rural recreation opportunities. This prescription covers the South Clear Creek and Leavenworth Creek corridors, including the Leavenworth Creek diversion structures. The project is consistent with this management prescription, however, a further discussion of the general direction for recreation is included below.

Management Prescription 3A (pg. III-138) emphasizes nonmotorized recreation and covers the higher elevations to the west of South Clear Creek. Murray and Silver Dollar Reservoirs fall within this prescription. The project is consistent with this management prescription, however, a further discussion of the general direction for recreation is included below, in the recreation section.

Management Prescription 7D (pg. III-183) provides for wood fiber production, and covers the NFS lands below Clear Lake. A section of affected stream falls within this prescription. The project is consistent with this management prescription.

Management Prescription 9A (pg. III-218) emphasizes maintaining and improvement of riparian areas. This prescription includes the area within approximately 100 feet, measured horizontally, from both edges of all perennial streams and from the shores of lakes, and other still water bodies, which in this case includes South Clear Creek below Clear Lake, Murray and Silver Dollar Reservoirs. The project is inconsistent with this management prescription, and will require the Forest Service to make a project specific amendment. A further discussion of the general direction for fisheries is included below.

### a. Fisheries

General Direction for Management Prescription 9A is to provide habitat to maintain viable populations of all native vertebrate species of fish and wildlife; and to maintain instream flows in cooperation with state wildlife agencies to support a sustained yield of natural fisheries resources. For this direction there are no standards and guidelines, so we refer back to the General Forest Plan Direction.

The General Direction section of the Forest Plan sets the baseline conditions that must be maintained throughout the Forest. For wildlife and fish management, habitat is to be maintained for viable populations of all existing vertebrate wildlife species. This is quantified as "habitat for each species on the forest will be maintained at least at 40 percent or more of potential" (pg. III-36). The Forest Service views potential as being measured from a pre-development state. Application of the 40 percent standard requires intensive quantification of aquatic habitat using the Instream Flow Incremental Methodology (IFIM). No such analysis has been completed, and it is unknown whether present habitat conditions are consistent with this standard.

In the absence of a detailed analysis, such as IFIM, the Plan also provides general direction to maintain the quality of those fish habitats that are capable of supporting



self-sustaining populations of salmonid species. This direction is quantified as an instream flow guideline of 25 percent of average annual daily flow (pg. III-39). For the section of stream between Clear Lake and the forebay, which includes Forest lands, an instantaneous minimum instream flow of 6.5 cfs is required to meet the 25 percent guideline.

The FS understands that a 6.5-cfs flow requirement may preclude operating the Georgetown Project economically. The FS also recognizes that 40 percent of habitat potential would probably be maintained at a lower flow level. Therefore, the FS is willing to consider a flow requirement of less than 6.5 cfs. Since the Cabin Creek facility provides a 3-cfs minimum flow from Cabin Creek's lower reservoir to Clear Lake, the FS says it is appropriate to apply the same flow level to South Clear Creek below Clear Lake. Therefore, the FS recommends an instantaneous minimum instream flow of 3 cfs for the section of stream between Clear Lake and the forebay. As a 4(e) condition, this effectively means that no flows for this reach can be set below 3 cfs. Since our lowest recommended flow is 3.25 cfs, our recommendation is consistent with the FS 4(e) condition.

The Forest Service requires disclosure of consistency with the Forest Plan for each alternative in draft documents. There are 3 alternatives presented for this project.

- The Public Service alternative proposes minimum flows of 4 cfs for summer months (May 1 to August 31) and 2 cfs for winter months (September 1 to April 30) for the stream reach between Clear Lake and the forebay. Although the minimum flows recommended by the Forest Service are achieved for the summer months, the flows fall below what is needed for maintenance of the fishery for the remaining months of the year, and are inconsistent with the general direction of the Forest Plan.
- The Alternative Environmental Measures would provide an instantaneous flow of 3.25 cfs for the winter months and 7.5 cfs for the summer months. These flows are less than those identified by the management prescription necessary to sustain the fishery, and are therefore, inconsistent with the Forest Plan.
- The No-Action alternative would provide no flow enhancements for the stream reach between Clear lake and the forebay and therefore would be inconsistent with the Forest Plan.

#### **b. Recreation**

Two important recreation goals of the plan are to recognize the significance of recreation in proximity to Front Range population centers, and to provide a broad range of dispersed and

developed recreation opportunities (pg. III-3). All of the alternatives maintain the existing facilities and meet these general goals. However the enhancements identified in the Public Service alternative and the Alternative Environmental Measures would increase and improve recreational opportunities.

Further, under the Alternative Environmental Measures, access to dispersed recreation via the Murray and Silver Dollar Lakes Trail would be protected. This action is consistent with the 3A Management Area Prescription, which gives general direction to provide facilities such as foot and horse trails.

Northeast Resource Management Plan - Bureau of Land Management (BLM). The BLM land at the project is in the process of being transferred to the Forest Service. The project would not affect this transfer. Our recommended measures would ensure that the public continues to have access to these lands, but would prohibit vehicular access, thereby protecting the environment from vehicular damage.

In conclusion, the only conflict we found is with the Forest Service's Land and Resource Management Plan. As we've discussed, the project is inconsistent with this management prescription, and will require the Forest Service to make a project specific amendment to their plan. We found no other conflicts with the relevant comprehensive plans for the project.

### **VIII. COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE**

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to all uses of the waterway on which a project is located. When we review a proposed project, the environment, recreation, fish and wildlife, and other nondevelopmental values of the project are considered equally with power and other developmental values. In developing whether, and under what conditions, a hydropower license and FS permit should be issued, we must weigh the costs and benefits of the various developmental and nondevelopmental uses of the waterway.

#### **A. Recommended Alternative**

Based on our independent review and evaluation of the proposed project, the proposed project with alternative environmental measures, and the no-action alternative, we have selected the proposed project with alternative measures (including implementation of enhancement measures proposed by Public Service -- incorporating minor modifications) with additional enhancement measures as the preferred option. We



recommend this option because: (1) the environmental measures that would be implemented with licensing would result in improvements in the existing human environment; (2) the project would continue to annually generate 5.46 GWh of low-cost power from a renewable resources; and (3) the electricity generated would be beneficial because it would continue to contribute to the reduction in use of fossil-fueled, electric generating plants, thereby conserving nonrenewable energy resources and reducing atmospheric pollution.

#### B. Developmental and Nondevelopmental Uses of the Waterway

This environmental assessment evaluates the effects of continuing to operate the Georgetown Project, and discusses measures we recommend to protect and enhance environmental resources associated with the project. Our preferred alternative includes the following measures:

- (1) limitations on Clear Lake reservoir drawdowns during the winter and spring for the enhancement of aquatic resources;
- (2) establishing a schedule that delays any water diversion from Leavenworth Creek until spring runoff has started for the protection of aquatic resources;
- (3) minimum flow releases downstream of Clear Lake and the forebay to protect water quality and enhance fishery and related recreational resources;
- (4) streamflow gaging and monitoring to ensure compliance with project flow releases and drawdown requirements for Clear Lake, and allowing agency access to facilities and monitoring records on project operation;
- (5) reopening the Georgetown license for the limited purpose of considering the project's role in maintaining appropriate instream flows in the South Clear Creek watershed whenever the license for Project 2351 expires, is reopened, or is amended regarding instream flows in South Clear Creek;
- (6) developing a cultural resources management plan to avoid and mitigate impacts of continued operation of the project;
- (7) developing improved public access for expanded recreational uses; and
- (8) retaining Murray, Silver Dollar, Green lakes and the Leavenworth diversion within the project license to maintain present cultural, recreational, wildlife, and fishery resources.

Among the measures we've selected, there are three measures, identified in the Developmental Resources section, that affect

the project's economics: (1) providing a minimum flow in the project bypass reach; (2) monitoring project streamflow releases; and (3) enhancing recreational opportunities. Here's how we support our recommendation to adopt these enhancement measures:

#### 1. Minimum instream flows

We agree that providing a minimum flow release in the bypass reach would benefit the fishery resources in the project area. Currently, the project's operation provides for a minimally viable fishery (relative size and numbers of fish are lower when compared to other similar reaches in the project area) in the bypass reach. The bypass reach is steep (13 percent stream gradient) with limited accessibility. The resource agencies' biseasonal flow recommendation of 7.5 cfs and 3.25 cfs would have a major impact on project economics (Table 7) because it would require winter shutdowns during low flow periods that could occur about every 2 years.

The proposal (resource agencies #2) to give the powerhouse priority during low-flow periods would avert winter shutdowns during low flow periods, and therefore would not require equipment to be winterized. This would lower the operation and maintenance costs over the license term.

The environmental impacts of this flow reduction during the winter period would not be significant because the bypass reach consists of a step-pool system, which provides adequate fishery habitat, as discussed in the Fisheries Resources section. In addition, the frequency of such low-flow occurrences would be roughly once every other year, and limited to a few weeks. The fishery could withstand lower flows for these short periods.

Even with a license condition giving priority to the powerhouse (Table 7) to operate at the minimum generation level during brief winter low-flow periods, a loss in the project's net annual benefit (about a 26 percent or \$22,000 loss annually) would occur, when compared to the potential gains (about 255 pounds of trout annually) in the fishery in the bypass.

As we've described, Public Service's flow proposal would avoid costly winter shutdowns and provide a modest enhancement to the fishery in the bypass reach. This proposal would reduce project benefits by 12 percent (or about \$10,000).

Also, it is likely that this reach would not attract additional public use because it is relatively inaccessible, the fishery is marginal, and there are better alternative fishing opportunities nearby (i.e., all the stream reaches above the forebay, including the reach between Clear Lake and the forebay, and also the excellent fishing opportunities at Murray and Silver Dollar lakes, and, if opened to the public, Green Lake).

In balancing both the fishery resources in the bypass reach and the power and economic benefits of the project, we agree with Public Service's proposal to provide an instream flow release of 4 cfs from May 1 to August 31, and 2 cfs from September 1 to April 30 in the bypass reach.

In summary, we recommend that Public Service implement two different instantaneous minimum flow regimes, one for the stream reach from Clear Lake to the forebay and another for the bypass reach (Table 9), for the enhancement of the project fisheries resources.

Table 9. Minimum instream flow releases in cubic feet per second (cfs) to be provided at the Georgetown Hydro Project.

Stream reach	Instream flow	Time period
Clear Lake to forebay	7.5 cfs*	May 1 - August 31
Clear Lake to forebay	3.25 cfs*	Sept. 1 - April 30
Bypass reach	4 cfs	May 1 - August 31
Bypass reach	2 cfs	Sept. 1 - April 30

\*note: flows as designated or natural inflow, whichever is less

## 2. Gaging requirements

We agree that a gaging plan is needed to monitor minimum flow regimes for the project, and drawdown rates from Clear Lake.

As we said in the Developmental Resource section, we estimate that gaging requirements for monitoring flow releases could range from \$30,000 to \$50,000 depending on the agreed upon approach to be taken by the resource agencies and Public Service. The total annual cost of gaging would be between \$8,360 to \$11,480 over the term of the license.

Again, we feel that this measure should be adopted because of the fishery benefits derived from implementing and monitoring flow regimes. The monitoring plan should include:

(1) A mechanism for measuring inflow into Clear Lake.

(2) A mechanism to monitor the minimum flow release, and drawdown rate from Clear Lake.

(3) A mechanism to monitor minimum flows released to the bypass reach.

A means to account for inflow from Leavenworth Creek into South Clear Creek is not needed with our recommended minimum flow in the bypass reach. Because the bypass reach minimum flow is less than the minimum flow release from Clear Lake, the flow from Leavenworth Creek is not a determining factor for minimum flow releases at the forebay.

Therefore, we recommend that Public Service develop a minimum flow monitoring plan, in consultation with the resource agencies, and submit it for Commission approval.

## 3. Recreation resources

We support Public Service's proposal to upgrade recreation facilities at Clear Lake by replacing picnic tables and charcoal grills, designating parking for the disabled, and installing interpretive signage. In addition, we recommend that Public Service prepare a plan for improving disabled access to the Clear Lake shoreline, improve the site's aesthetics by doing some minor regrading and reseedling, and permit non-motorized boating.

We believe these measures are justified by the heavy use that Clear Lake attracts, which is about 3,758 people per summer season. Based on our estimated value for recreational fishing at the project (\$11.00 to \$13.50 per visit), the recreational value of Clear Lake is \$41,338 to \$50,625 per year. In comparison, we estimate the total cost of these enhancements at about \$25,540. Therefore, we recommend that Public Service improve public access for expanded recreational uses.

Finally, we agree with the BLM and the FS that public vehicular access across South Clear Creek at the south end of the project forebay should be restricted to protect Georgetown's water supply, but that non-motorized access should be encouraged to protect public recreational opportunities. We believe that the amount of use that the area receives justifies our estimated cost of \$2,000 to accomplish this.

## C. Removal of Facilities from the Project License

Public Service proposes to remove Green Lake and its diversion from Leavenworth Creek, and also Murray and Silver Dollar lakes from the project license. We disagree with Public Service's proposal.

If Murray, Silver Dollar, and Green lakes are removed from the license, the expenses associated with providing increased recreation and ensuring public access to the lakes, as well as repairing Murray and Silver Dollar lakes would be eliminated.



However, removal of the reservoirs could have adverse effects on fisheries, wildlife, cultural, and recreational resources.

If Murray and Silver Dollar lakes remain in the subsequent license, Public Service could be required to (1) increase power generation of the project by repairing the outlet works of both reservoirs to an operational state, or (2) leave the outlet works in their current non-operational state. As described earlier, the additional power that would be generated by repairing the outlet works at Murray and Silver Dollar lakes would be minimal, and does not justify the cost of the repairs.

Furthermore, fluctuating flows would affect recreation, fisheries, wildlife, and aesthetics, as discussed in more detail below. These adverse effects outweigh the potential benefits of the small increase in power generation. On the other hand, if Murray and Silver Dollar lakes remain in the license but are kept in their current non-operational state, there would be no costs associated with operating the outlet works, and the resources referred to above would be protected.

Therefore, we recommend that the reservoirs be kept in the project license based on public interest (section 10(a) of the Federal Power Act) to protect fisheries, wildlife, cultural, and recreational resources.

A detailed discussion of the potential adverse impacts to fishery, wildlife, cultural, and recreational resources from removing the reservoirs from the license follows.

#### 1. Fisheries resources

Public Service's proposal would have no effect on the fishery resource at Green Lake since Public Service says they will maintain the water surface elevations; however, there could be an effect to the fishery resource at Murray and Silver Dollar lakes if they were removed from the project.

Should Public Service use Murray and Silver Dollar reservoirs to replace evaporative water losses at the Cabin Creek Project, the fluctuating reservoirs (depending on variables like season and climate) could either reduce or eliminate the cutthroat fishery in these high alpine lakes.

Similar negative impacts would occur if the dams were removed and the lakes permanently lowered to historic lake levels.

Therefore, we agree with the CDOW, the FWS, and the BLM, that the best approach for managing the lakes would be to maintain the present water surface elevations for the protection of the fishery.

#### 2. Wildlife resources

Any management scenario that includes periodically drawing down and refilling Murray and Silver Dollar lakes would adversely affect riparian vegetation because the periodic inundation would prevent plants from successfully colonizing the shoreline. Whenever storage water is drawn down, an unvegetated zone would be exposed leaving a "bathtub ring" around the reservoir.

Permanently lowering the lakes would leave a zone of unvegetated shoreline that would be slow to recolonize because of the severe growing conditions found at about 11,000 feet msl.

Therefore, our preferred alternative would be that the lakes not be periodically drawn down, or permanently lowered.

#### 3. Cultural resources

An adverse effect to the Historic District would occur from Public Service's proposal to remove Murray and Silver Dollar lakes (and possibly Green Lake and the Leavenworth diversion), according to the regulations of the Council for implementing the National Historic Preservation Act.

Specifically, the following adverse effects would occur:

- The facilities proposed for removal from the project may be subject to modification by new owners or administrators once removed from the license, resulting in an adverse effect on their historical integrity.
- Future repair and maintenance work, on both those facilities left in the project and those taken out, may affect the historical integrity of the facilities, unless special care is taken to avoid or minimize such effects. Differential treatment of District facilities by separate administrative entities inside and outside of the project may result in adverse effects.
- The District facilities are not significant on an individual basis but only as a group. Modification of any one facility would have adverse effects on the group as a whole.
- These effects may have an adverse effect on the Landmark. The District and the Landmark are located next to each other, and document the same period of history.

Retaining the District facilities within the project, and implementing our recommended Cultural Resource Management Plan, reduces the impact of the project on the District and Landmark from an adverse effect to a no effect in the terms of the Council's regulations.



#### 4. Recreational resources

We disagree with removing Green Lake from the project. We recommend that the lake be opened to the public for recreation, including non-motorized boating as recommended by the CDOW and the FWS because of the documented high demand for shore fishing in the region, and because facilities at nearby Clear Lake are often used to capacity. Assuming, as a worst case scenario, that this would involve constructing all-new facilities at the lake, this enhancement would have a one-time cost of about \$30,000. We believe this cost would be outweighed by the amount of public use that we've estimated Green Lake would attract (940 users per season), and which we've valued at \$10,340 to \$12,690 annually.

We also disagree with removing Murray and Silver Dollar Lakes from the license. About 4,000 people use the trail to these lakes each year for fishing, hiking, and sightseeing. Keeping the lakes under the license would ensure that water surface elevations are maintained, protecting their recreational value. In addition to keeping the lakes in the license, we agree with the FS that the trail up to the lakes either be rerouted around private land or that an access easement be secured so public access is guaranteed over the term of a subsequent license. We've estimate that this would cost about \$10,000. Again, we believe that the level of public use of this resource justifies this cost.

Therefore, from a recreational or public use standpoint, our preferred alternative would be to maintain the lakes' present status, particularly in terms of no water level fluctuation, by retaining the lakes with the FERC license conditioned not to allow drawdown.

#### D. Conclusion

The staff recommended enhancement measures would add about \$41,000 annually to the cost of the project to the ratepayers. We believe the benefits that would be derived from these measures--summarized above and discussed in the Environmental Analysis section--would be worth this additional cost.

We disagree with removing any of the reservoirs from the project license and find that it would be in the public interest to keep them as a part of the project. Additionally, to protect the resources associated with the lakes, water surface elevations should be maintained.

From our evaluation of the environmental and the economic effects of the project and the alternatives, we conclude that relicensing the project with our recommendations would best adapt the project to a comprehensive plan for developing the South Clear Creek watershed.

#### IX. RECOMMENDATIONS OF FISH AND WILDLIFE AGENCIES

Under the provisions of the Federal Power Act (FPA), as amended by the Electric Consumers Protection Act of 1986, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project.

Section 10(j) of the FPA states that whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

We believe that our recommendations contained in this assessment are consistent with those filed by the federal and state fish and wildlife agencies with three exceptions (see table 10).

Recommendations that are considered outside the scope of Section 10(j) were considered under Section 10(a) of the FPA and are addressed in the specific resource section of this document.

Under Section 10(j) of the FPA, we are making a determination that three of the agencies recommendations are inconsistent with the purpose and requirements of Part 1 of the FPA or other applicable law. We did not adopt the FWS's and the CDOW's recommendation to release a biseasonal minimum flow in the bypass reach of 7.5 cfs (April 1 to October 31) and 3.25 cfs (November 1 to March 31), because the benefits are not worth the cost (see Comprehensive Development and Recommended Alternative section).

Our biseasonal flow recommendation for the bypass reach (4 cfs (April 1 to October 31) and 2 cfs (November 1 to March 31)) would allow the project to operate without costly winter shutdowns, and provide aquatic enhancement in the bypass reach. Therefore, we find that the recommendation is inconsistent with the public interest standard of section 4(e) of the FPA and the comprehensive planning standard of section 10(a) of the FPA.

We did not adopt FWS's recommendation that during spring refilling of Clear Lake, Public Service change outflows no more than once per week. In a radical snowmelt system like that found in South Clear Creek, limiting the frequency of changes in flow releases doesn't account for the sudden large changes in flow that can occur. Better protection of aquatic resources is

provided by providing more frequent but smaller incremental changes compared to larger changes occurring less often, as recommended by CDOW.

Our drawdown recommendation provides smaller incremental changes that should provide better aquatic resource protection than provided by FWS's recommendation. FWS has not provided any evidence to show that less frequent flow release adjustments are needed to protect the aquatic resources. Therefore, we find FWS's recommendation inconsistent with the substantial evidence standard of section 313(b) of the Federal Power Act.

We did not adopt CDOW's recommendation for specific stream gage locations because with our flow recommendation we disagreed with the need to have a streamflow gage at the forebay inlet. We believe that with a lower recommended flow in the bypass reach, there is no need to monitor the inflow from the Leavenworth drainage basin. As we have discussed in the Developmental resource section, stream gages are costly, and should only be required when needed. Since we do not believe this gage is needed to monitor the operation of the project, we can avoid this unnecessary expense.

Our recommendation is to develop a gaging plan for the project. The plan should include, but not be limited to, a schedule for installing the streamflow monitoring equipment, determining the location and design of the monitoring equipment, the method of flow data collection. Therefore, we find that the recommendation is inconsistent with the public interest standard of section 4(e) of the FPA and the comprehensive planning standard of section 10(a) of the FPA.

Table 10. Analysis of fish and wildlife agency recommendations

Recommendation	Agency	Within scope of section 10(j)	Conclusion
minimum instream flow releases	FWS CDOW	Yes	Not Adopted • (SV.B.2)--at lower minimum flow releases in bypass reach • (SV.B.2)--at Clear Lake releases as minimum flow or natural inflow if less • inconsistent with sections 4(e) and 10(a) of the FPA
drawdown recommendations	FWS	Yes	Not Adopted • (SV.B.1)--recommended adjusting streamflows more often during spring refilling to provide more gradual changes in streamflows • inconsistent with section 313(b) of the FPA
drawdown recommendations	CDOW	Yes	Adopted
retain Murray and Silver Dollar lakes in subsequent license	FWS CDOW	No--not a specific measure to protect fish and wildlife	Adopted
maintain water surface elevations at Murray and Silver Dollar lakes	FWS CDOW	Yes	Adopted
retain Green Lake in the subsequent license	FWS CDOW	No--not a specific measure to protect fish and wildlife	Adopted
maintain water surface elevations at Green Lake	CDOW	Yes	Adopted
open Green Lake to public access	FWS CDOW	No--not a specific measure to protect fish and wildlife	Adopted
specified stream gage locations	CDOW	Yes	Not Adopted • (SVIII.2)--recommended developing a gaging plan • inconsistent with sections 4(e) and 10(e) of FPA
Schedule for Leavenworth water diversions	CDOW	Yes	Adopted
retain Leavenworth water diversion in subsequent license	FWS CDOW	Yes	Adopted
non-motorized boating on Clear Lake	CDOW	No--not a specific measure to protect fish and wildlife	Adopted

## XI. LITERATURE CITED

- Advisory Council on Historic Preservation. 1986. 36 CFR Part 800: protection of historic properties. Washington, D.C.
- Advisory Council on Historic Preservation. 1989. Preparing agreement documents. Washington, D.C.
- Binns, N. Allen. 1979. A habitat quality index for Wyoming trout streams. Monogr. Ser., Fish. Res. Rep. 2. Cheyenne, WY:Wyoming Game and Fish Department. 75p.
- Binns, N.A., F.M. Eiserman. 1979. Quantification of fluvial trout habitat in Wyoming. Transactions of American Fisheries Society. 108:215-228.
- Bovee, K.D. 1985. Presentation to the Minimum Instream Flow Maintenance Subcommittee of the Virginia State Water Plan Advisory Committee, 30-31 Jan. 1985, Richmond, VA.
- Carey, C. 1993. Hypothesis concerning the causes of the disappearance of the boreal toad from the mountains of Colorado. Conservation Biology 7:355-362.
- Colorado Division of Parks and Recreation. 1986. Statewide Comprehensive Outdoor Recreation Plan. Denver, Colorado.
- Colorado Division of Wildlife. 1985. Fish Culture and Stocking in Colorado, 1872-1978. Wiltzius, William J. June, 1985.
- Colorado Division of Wildlife. 1993. Comments and recommendations on Public Service of Colorado's new license application for the Georgetown Project, FERC No. 2187. March 15, 1993.
- Currier, P.J., G.R. Lingle, and J.G. VanDerwalker. 1985. Migratory bird habitat on the Platte and North Platte Rivers in Nebraska. Platte River Whooping Crane Critical Habitat Maintenance Trust. Grand Island, Nebraska. 177 pp.
- Federal Energy Regulatory Commission. 1992. Draft environmental impact statement for the Kingsley Dam Project (FERC Project No. 1417) and the North Platte/Keystone Diversion Dam Project (FERC Project No. 1835). Office of Hydropower Licensing. Washington, D.C.
- Gumtow, R.B. 1955. An investigation of the periphyton in a riffle of the West Gallatin River, Montana. Trans. Am. microsc. Soc. 74, 278-92.
- Hammerson, G.A. 1986. Amphibians and reptiles in Colorado. Colorado Division of Wildlife, Denver, Colorado.
- Hartmann, J. 1991. Letter from James Hartmann, State Historic Preservation Officer, Colorado Historical Society, Denver, Colorado. May 1, 1991.
- Humphery, J.H., R.C. Hunn, and G.B. Shea. 1985. Hydraulic characteristics of steep mountain streams during low and high flow conditions and implications for fishery habitat. Paper presented at the Symposium on Small Hydropower and Fisheries, May 1-5, 1985. Aurora, Colorado.
- Hynes, H.B.N. 1970. The Ecology of Running Waters. Liverpool University Press, Liverpool L7 7AF. 555 pp.
- Krapu, G.L., K.J. Reinecke, and C.R. Frith. 1982. Sandhill crane and the Platte River. Transactions of the North American Wildlife Natural Resource Conference 47: 542-552.
- Leopold, L.B., M.G. Wolman & J.P. Miller. 1964. Fluvial Processes in Geomorphology. Freeman, San Francisco, CA. 522 pp.
- Lore, J.M., M.J. Sale. 1981. Analysis of Environmental Issues Related to Small-scale Hydroelectric Development. V. Instream Flow Needs for Fishery Resources. ORNL/TM-7861, Environmental Sciences Division Publi. No. 1928, Oak Ridge National Laboratory, Oak Ridge, TN.
- Lyons, J., and T. Randle. 1988. Platte River channel characteristics in the Big Bend Reach--Prairie Bend Project. Department of the Interior, Bureau of Reclamation, Denver, Colorado. 28 pp.
- Nehring, R.B., and D.D. Miller. 1987. the influence of spring discharge levels on rainbow trout recruitment and survival, Black Canyon of the Gunnison River, Colorado, as determined by IFIM/PHABSIM models. Proceedings of the Annual Conference of the Western Association of Fish and Wildlife Agencies, Salt Lake City, Utah.
- Public Service Company of Colorado. 1991. Application for new minor license, Georgetown Hydroelectric Project, FERC Project No. 2187, Colorado. Denver, Colorado. December 30, 1991.
- Public Service Company of Colorado. 1992. Additional information filed on the new license application for the Georgetown Project, FERC No. 2187. July 23, 1992.



Public Service Company of Colorado. 1993. Motion to file reply comments out of time. FERC No. 2187. May 6, 1993.

Rosgen, D.L. 1993. Manuscript -- A Classification of Natural Rivers. In review-submitted to Catena.

Trihey, W.E., and J.E. Baldrige. 1985. An empirical approach for evaluating microhabitat response to streamflow in steep gradient, large bed-element streams. Paper presented at the symposium on Small Hydropower and Fisheries, May 1-5, 1985. Aurora, Colorado.

Tate, M., T. Simmons, and R. Simmons. 1991. Cultural resources of the Georgetown Hydroelectric Project Area, Clear Creek County, Colorado. Archeology Department, Powers Elevation Company, Inc., Aurora, Colorado. June 18, 1991.

Tennant, D.L. 1975. Instream Flow Regimes for Fish, Wildlife, Recreation, and Related Environmental Resources. U.S. FWS Report, Billings, MT.

U.S. Department of Agriculture, Forest Service. 1984a. Final environmental impact statement for the Arapaho and Roosevelt National Forests and Pawnee National Grassland. U.S. Department of Agriculture, Ft. Collins, Colorado.

U.S. Department of Agriculture, Forest Service. 1984b. Land and Resource Management Plan - Arapaho and Roosevelt National Forests and Pawnee National Grassland. Rocky Mountain Region, USDA, FS. March 1984.

U.S. Department of Agriculture, Forest Service. 1993. Letter from Elizabeth Estill, Regional Forester, Lakewood, Colorado. March 19, 1993.

U.S. Department of Agriculture and U.S. Department of Interior. 1990. Design Guide for Accessible Outdoor Recreation - interim draft for review. Interagency Task Group for Accessible Outdoor Recreation. San Dimas, California.

U.S. Department of the Interior, Bureau of Land Management. 1986. Record of Decision for Northeast Resource Management Plan. Interior, BLM Canon City District, Colorado Northeast Resource Area. September 1986.

U.S. Department of the Interior, National Park Service. 1983. The Secretary of the Interior's -- Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings (Revised 1983). Washington, D.C.

U.S. Department of the Interior. 1993. Letter from Robert F. Stewart, Regional Environmental Officer, Department of the Interior, Denver, Colorado, March 19, 1993.

U.S. Fish and Wildlife Service. 1986. Endangered species technical bulletin vol. 11, no. 1, p. 3.

\_\_\_\_\_. 1988. Endangered species technical bulletin vol. 13, no. 11-12, p. 4.

\_\_\_\_\_. 1989. Endangered species technical bulletin vol. 14, no. 8, p. 8.

\_\_\_\_\_. 1990. Endangered species technical bulletin vol. XV no. 10, October, p. 3.

\_\_\_\_\_. 1992. Endangered species technical bulletin vol. 17, no. 12, p. 13.

\_\_\_\_\_. 1992b. Letter from LeRoy W. Carlson, Colorado State Supervisor, U.S. Fish and Wildlife Service, Golden, Colorado, November 23, 1992.

\_\_\_\_\_. 1992c. Pallid Sturgeon Draft Recovery Plan. Region 6, U.S. Fish and Wildlife Service, Denver, CO, June 1992.

\_\_\_\_\_. 1993c. Draft biological opinion for Idylwild Hydroelectric. October 19, 1993, Denver, Colorado.

Walsh, Richard G. 1986. Recreation Economic Decisions: Comparing Benefits and Costs. Venture Publishing, Inc., State College, Pennsylvania. 637 pp.

Wesche, T.A., P.A. Rechard. 1980. A Summary of Instream Flow methods for Fisheries and Related Research Needs. Eisenhower Consortium Bulletin 9, Water Resour. Res. Inst., Univ. of Wyoming, Laramie, Wyoming.

Wiltzius, William J. 1985. Fish Culture and Stocking in Colorado, 1872-1978. Division Report No. 12, Colorado Division of Wildlife, June 1985.

World Health Organization. 1972. Evaluation of Certain Food Additives and the Contaminants of Mercury, Lead and Cadmium. Sixteenth Report of the Joint FAO/WHO Expert Committee on Food Additives, Geneva. 33p.

## XII. LIST OF PREPARERS

Keith Kirkendall, EA Coordinator, FERC -- Water and Fisheries Resources (Fishery Biologist; M.S., Fisheries Biology)

Kim Berns, EA Coordinator, FS (Land Forester)

Carl Chambers, FS -- Water Resources (Hydrologist; Experience and education in watershed computer simulation)

Roland George, FERC -- Need for Power (Electrical Engineer; B.S., Electrical Engineering)

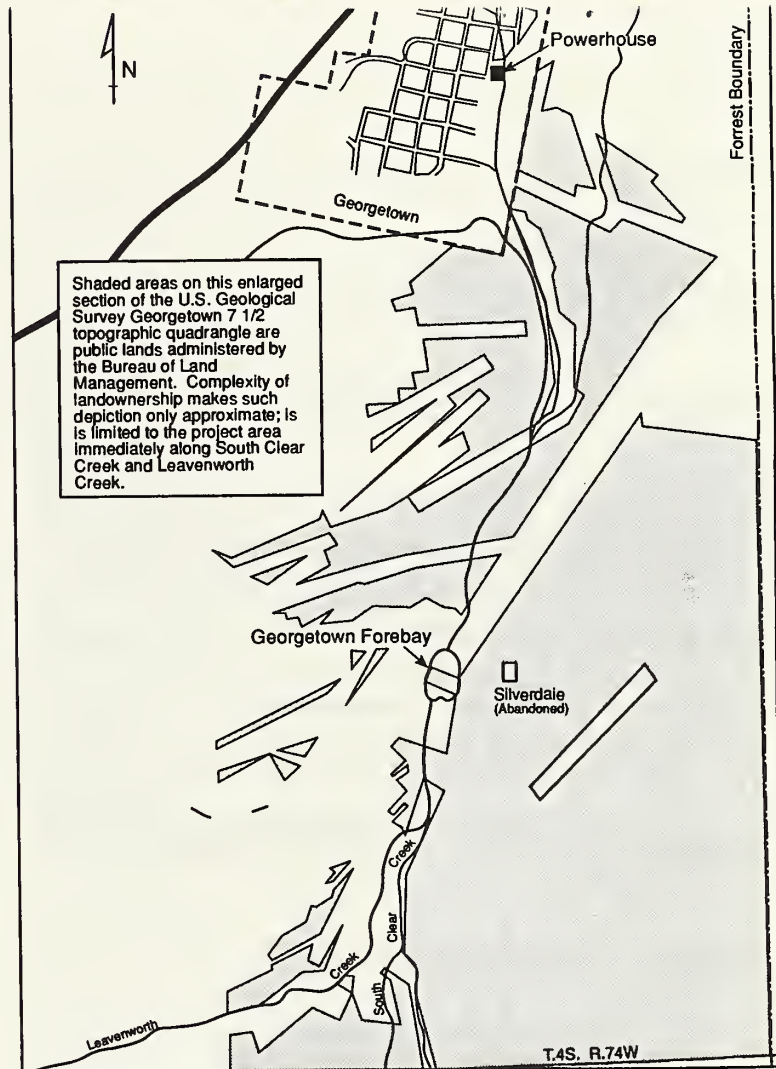
David Gerhardt, FS -- Fisheries Resources (Fishery Program Manager; Experience and education in fisheries biology and environmental biology)

Kim A. Nguyen, FERC -- Developmental Resources (Civil Engineer, B.S., Civil Engineering)

Dianne Rodman, FERC -- Vegetation and Wildlife, Threatened and Endangered Species (Ecologist; M.S., Biology).

Edwin Slatter, FERC -- Cultural Resources (Archeologist; Ph.D., Anthropology)

Vince Yearick, FERC -- Recreation and Land Use (Environmental Protection Specialist; M.S., Recreation and Parks)



Appendix A. Public Lands and privately owned lands interspersed in Project vicinity.

## APPENDIX B

### Proposed License Conditions

#### A. Operational Plan for Clear Lake

The licensee, shall operate the project so that the Clear Lake drawdown begins on February 1 of each year and change in outlet discharge to South Clear Creek shall not exceed 50 percent per week. As active storage is depleted, outflow to South Clear Creek should be decreased according to this 50 percent rule. Discharge should be equal to or greater than natural inflow before February 1. When refilling Clear Lake, changes in flow shall be limited to the 50 percent per week, or daily if needed, until spilling or natural inflow to Clear Lake is reached, whichever occurs first.

The maximum rate of change may be modified if required by operating emergencies beyond the control of the licensee, and for short periods for project maintenance purposes, upon mutual agreement between the licensee and the U.S. Fish and Wildlife Service, the Colorado Division of Wildlife, and the Forest Service. If the reservoir drawdown rate is so modified, the licensee shall notify the Commission as soon as possible, but no later than 10 days after each such incident.

The location at which to measure drawdown rate compliance shall be mutually determined by the licensee, the U.S. Fish and Wildlife Service, the Colorado Division of Wildlife, and the Forest Service as required by Condition E.

#### B. Operational Plan for the Leavenworth Creek Diversion

Within 6 months after issuance of the license, the licensee shall file, for Commission approval, a plan for diverting flows from Leavenworth Creek to Green Lake that protects the aquatic resources in Leavenworth Creek. The diversion plan shall include the flexibility needed to account for changes in timing water diversions to when spring runoff begins. The plan shall also include a means to verify compliance of diversions starting after spring runoff has begun.

The licensee shall prepare the plan in consultation with the U.S. Fish and Wildlife Service, The Colorado Division of Wildlife, and the Forest Service. The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations prior to filing the plan with

the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project specific information.

The Commission reserves the right to require changes in the plan. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

#### C. Coordinating Operations with FERC Project No. 2351

The licensee shall, for the limited purpose of coordinating operations with FERC Project No. 2351 for the enhancement of fish resources in South Clear Creek downstream of lower Cabin Creek Reservoir, comply with such reasonable modifications of project operations, as may be ordered by the Commission upon the relicensing or amendment of the license for FERC Project No. 2351, after notice and opportunity for hearing.

#### D. Minimum Flows

The licensee shall release the following minimum flows into South Clear Creek for the protection and enhancement of fish and wildlife resources.

Stream Reach	Instream Flow (cubic feet/second)	Time Period
Clear Lake to forebay	7.5 cfs*	May 1 - August 31
Clear Lake to forebay	3.25 cfs*	Sept. 1 - April 30
Bypass reach	4 cfs	May 1 - August 31
Bypass reach	2 cfs	Sept. 1 - April 30

\*note: flows as designated or natural inflow, whichever is less

This flow may be temporarily modified if required by operating emergencies beyond the control of the licensee, and for short periods upon agreement between the licensee and the U.S. Fish and Wildlife Service, The Colorado Division of Wildlife, and the Forest Service. If the flow is so modified, the licensee shall notify the Commission as soon as possible, but no later than 10 days after each such incident.

#### E. Monitoring Plan

Within 6 months after issuance of the license, the licensee shall file, for Commission approval, a monitoring plan to ensure



compliance of the minimum flow releases required by condition D and the operational requirements for Clear Lake, as described in Condition A. The monitoring plan shall include:

- (1) A mechanism for measuring inflow into Clear Lake.
- (2) A mechanism to monitor the minimum flow release and drawdown rate from Clear Lake.
- (3) A mechanism to monitor minimum flows released to the bypass reach.

The plan shall include, but not be limited to: a schedule for installing the streamflow monitoring equipment, determining the location and design of the monitoring equipment, the method of flow data collection, and a provision for providing the flow data to the resource agencies within 30 days after the date of the agencies' request for the data.

The licensee shall prepare the plan in consultation with the U.S. Fish and Wildlife Service, The Colorado Division of Wildlife, and the Forest Service. The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations prior to filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project specific information.

The Commission reserves the right to require changes in the plan. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

#### F. Cultural Resource Protection

The licensee, after consultation with the Colorado State Historic Preservation Officer (SHPO), shall implement the cultural resources management plan (plan) commented on by the Advisory on Historic Preservation prior to licensing of the project, to avoid and mitigate impacts to the Georgetown Historic Hydroelectric District (District), the Georgetown-Silver Plume National Historic Landmark (Landmark), and any archeological or historic sites discovered during project operation.

Within one year after the date of the license, the licensee shall file, for Commission approval, the District and Landmark Facilities Maintenance Plan and the National Register Report on Green Lake Dam and Reservoir and Green Lake Ditch, as identified in the plan, together with a letter from the SHPO commenting on

these documents. The Commission may require additional work and changes to the plan based on this filing.

#### G. Recreational Plan

The licensee, within 12 months from the date of issuance of this license, shall file with the Commission for approval, a revised recreation plan for the Georgetown Project.

The plan shall include, at a minimum, the following:

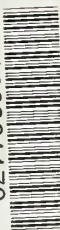
- Provisions to encourage non-motorized and restrict motorized public access to and across South Clear Creek at the south end of the project forebay. Vehicular access across South Clear Creek in this vicinity by Bureau of Land Management personnel shall, however, be permitted.
- Provisions for opening Green Lake to public use for fishing and car-top, non-motorized boating. To control cost, existing parking and restroom facilities at Green Lake shall be modified for this use if feasible.
- Provisions for opening Clear Lake to car-top, non-motorized boating.
- Provisions for upgrading existing facilities at Clear Lake to include: installing a disabled accessible picnic table and charcoal grill, ensuring that all picnic tables and grills are of Forest Service-approved design, ensuring that the restrooms meet current Forest Service access standards, and installing an interpretive sign.
- Results of a feasibility study and a recommended design for proving a disabled accessible path to the Clear Lake shoreline.
- Provisions for either rerouting the Murray and Silver Dollar Lakes trail around private land at Naylor lake or for obtaining a public access easement across these lands.
- Measures to control soil erosion and sedimentation, and to revegetate disturbed areas, from any planned ground disturbing activities.
- A discussion of who will operate and maintain each of the above facilities.

The plan shall be prepared after consultation with: the Forest Service, the Bureau of Land Management, the Colorado Department of Wildlife, and the Town of Georgetown. The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the consulted entities, and

specific descriptions of how the entities' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the entities to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. No modification or enhancement activities covered by the plan shall begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

NATIONAL AGRICULTURAL LIBRARY



102232170



\* NATIONAL AGRICULTURAL LIBRARY



1022321170